A REPORT ON REST-ROTATION GRAZING ON THE PLEASANT VIEW UNIT IN ONEIDA COUNTY, IDAHO

BY

RONALD E. DEAN

1969

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to

THE BUREAU OF LAND MANAGEMENT

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PREFACE

The Pleasant View Unit was the first major area in Idaho under the administration of the Bureau of Land Management to be placed under an intensive management system to correct range abuse rather than to reduce the livestock numbers and/or reduce the season of use. Because of this, it was felt that the effects the new grazing system had on the range should be closely observed and documented. Consequently, this study was initiated in 1967 and was designed to describe the range and make suggestions to insure the success of the new system.

The field data for this study was gathered during the summers of 1967 and 1968 by this researcher while employed as a range technician by the Burley, Idaho District of the Bureau of Land Management.

I wish to extend a special thanks to the following organizations and persons for making this study possible: to the Bureau of Land Management for their financial aid, for the use of their equipment and for their guidance; to the University of Idaho for the use of their equipment and especially to Dr. Lee A. Sharp for his advice and guidance throughout this study; to the Pleasant View Livestock Association for their cooperation; to Bernard Spanogle for his assistance in gathering the field data during the summer of 1967; to Loah D. Dean for typing this report; to Robert and Mary Dean for the use of their horses and assistance; and to my wife, Diane, for her constant encouragement and support.

PREFACE

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ABSTRACT

The Bureau of Land Management is attempting to restore the productivity of the Pleasant View Unit with a six pasture rest-rotation grazing system instead of making reductions in livestock numbers and/or season of use.

Areas that have been subjected to grazing livestock in the past show greatly reduced frequencies and quantities of perennial grasses, plus high frequencies of invading forbs and dense stands of big sagebrush. The existing date to begin grazing in the spring (May 1) is too early for optimum livestock production. It appears that the cattle, especially lactating cows, cannot gather an adequate amount of forage to satisfy their energy needs, and consequently, the calf production on the unit has been reduced.

The rest-rotation grazing system and the range improvements that accompanied it have allowed the range to improve. Livestock production on the Pleasant View Unit could be increased by selecting a date to begin spring grazing that is dependent on the phenological stage of the range, by placing more bulls on the range, and by eradicating the dense stands of big sagebrush and seeding these areas with grass.

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INTRODUCTION

Reducing livestock numbers and/or shortening the grazing season has been the common procedure followed by federal agencies in correcting range abuse. Only in recent years have other alternatives been considered. Such was the case on the Pleasant View Unit near Malad, Idaho.

A forage inventory conducted in 1965 by the Bureau of Land Management on the Pleasant View Unit revealed the need for a 58 percent reduction in cattle numbers. Many of the 82 ranchers who graze cattle on the unit operate small, economically marginal ranches and depend on this summer pasture for their year-long operations. A 58 percent reduction in cattle numbers would have created severe financial hardship for many of these people. Recognizing this as a problem of resource management, the Bureau of Land Management is attempting to correct the situation by installing a six pasture rest-rotation grazing system in place of continuous grazing.

At present, the Bureau of Land Management[1] plans to install some type of grazing system on all of its districts. In Idaho, Pleasant View Unit was the first major area in which the rest-rotation system was established by this agency and will serve as a demonstration area. Success or failure of this project will affect the grazing management of other grazing districts in the state.

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[1] Hereafter the Bureau of Land Management will be referred to as the BLM.

The objectives of this study were (1) to describe the present range condition, (2) to provide data that will indicate either improvement or deterioration of the range because of the present system, and (3) to ascertain what improvements can be made in the present situation that will maintain and/or improve range condition without requiring a reduction in the number of livestock grazing the Pleasant View Unit.

DESCRIPTION OF THE AREA

Location

The Pleasant View mountains are located in Oneida County in Southern Idaho, near the Utah border (Figure 1). This area is the northern extension of the Wasatch Mountain Range (Howell, 1960) and is known locally as the "West Hills." The boundaries are roughly the Little Malad River on the east, Pocatello Valley on the south, State Highway 38 on the west, and the Oneida County line on the north. The nearest town is Malad City which lies ten miles to the east.

Physical Features

Topography

The Pleasant View Grazing Unit is approximately 20 miles long and 12.5 miles wide (Figure 1). The area contains 70,780 acres of which 59,946 acres are public domain, 3,200 acres are state owned, and 7,534 acres are privately owned. With the exception of the canyon bottoms, nearly all the area is steep (slopes up to 70%) with a main ridge running north and south through the unit. Ten large canyons and many small draws run east and west up to the main ridge. Elevations range between 4,800 feet and 7,400 feet. The elevational difference of 2,200 feet, in

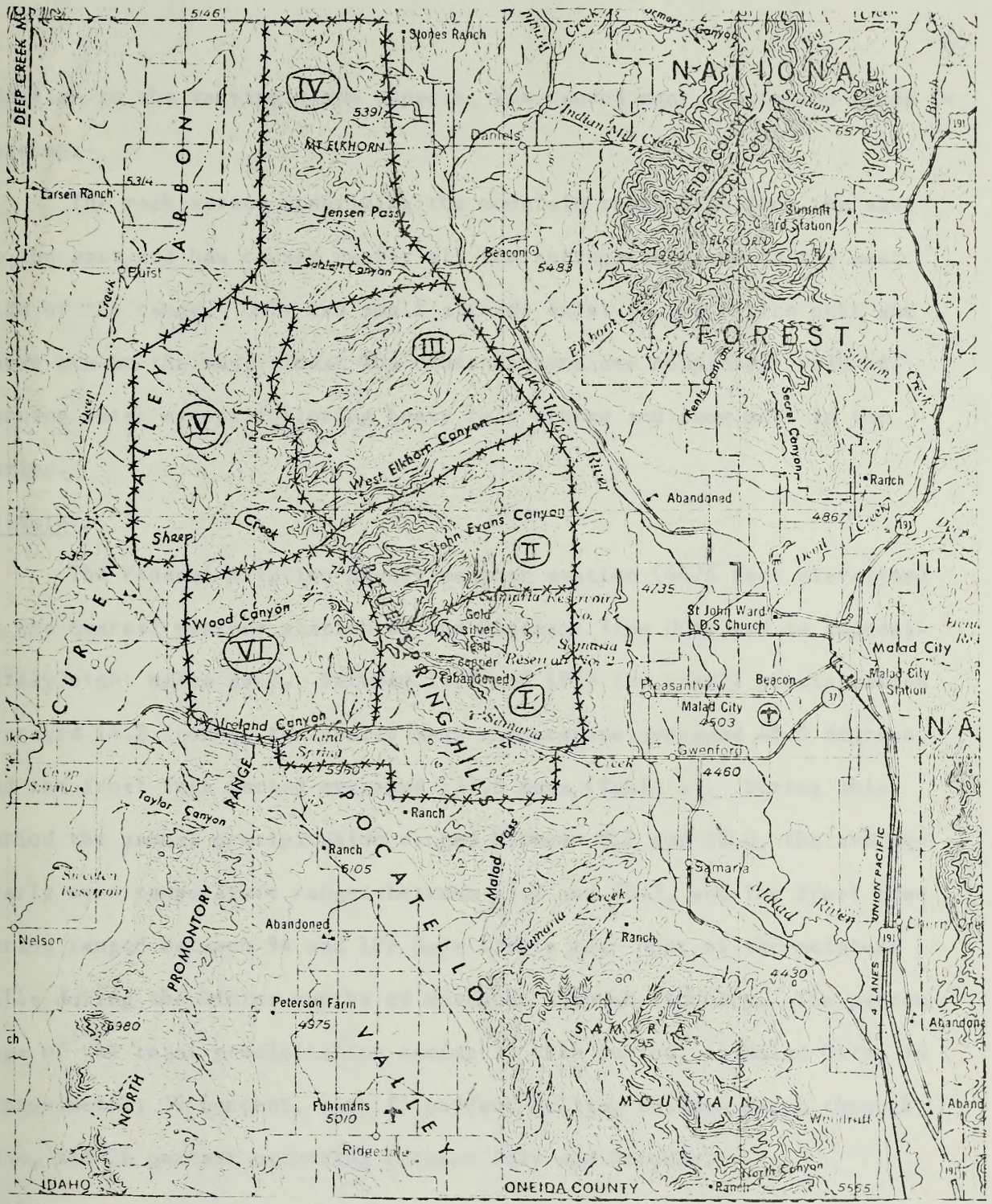

Figure 1. Physiographic features and general locations of the pastures on the Pleasant View Grazing Unit.[2]

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[2] U.S. Geological Survey. Pocatello, Idaho Topographic Map, scale 1:250,000. 1958.

addition to the varying slope aspects, has caused many vegetation types to develop.

The rock strata underlying the mountain range dips from the east to the west and has caused nearly all the springs to occur on the west side of the range. Only two small streams exist in the entire unit and these are on the west side. The other canyons are completely void of running water except following heavy rain storms and snow melt in the spring.

Climate

The Federal Aviation Agency weather station (4476 feet elevation) is the nearest weather station to the Pleasant View Unit and is approximately eight miles away. Between 1922 and 1966 the yearly precipitation averaged 14.2 inches, the yearly mean temperature averaged 46.5 degrees, and the frost free period averaged 123.8 days (Table 1). During this period the annual precipitation ranged between 8.2 and 22.0, the average yearly mean temperature ranged between 43.8 and 50.3, and the frost free period ranged between 94 and 182 days (Table 1). Most of the moisture falls during the winter months of November through February. The percentage of the total precipitation coming in this period, in Malad City, is approximately 39 percent, with 35 percent falling between March through June, and 26 percent occurring between July and October.

Soils

Soils within the allotment are largely granitic and limestone

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Table 1. Average temperature in degrees F, annual precipitation in inches and growing season in days for Malad, Idaho for a 45 year period, 1922-1966[3]

Location: 42° 12' Latitude
112° 16' Longitude
Elevation: 4,420 feet

Year	Avg. Temp.	Annual Precip.	Frost Free Period	Year	Avg. Temp.	Annual Precip.	Frost Free Period
1922	43.9	14.8	101	1945	46.0	20.5	97
1923	43.8	16.1	114	1946	47.2	15.5	127
1924	44.0	9.8	103	1947	47.0	15.9	-
1925	45.7	18.1	149	1948	46.1	12.8	138
1926	46.2	13.0	128	1949	46.1	16.9	149
1927	-	17.3	107	1950	46.5	16.3	116
1928	-	9.7	102	1951	45.6	16.3	101
1929	45.0	15.0	96	1952	46.2	11.0	152
1930	-	22.0	102	1953	48.9	10.6	131
1931	46.5	11.5	113	1954	48.5	10.5	119
1932	44.0	15.6	97	1955	45.2	18.7	117
1933	45.1	12.3	124	1956	47.0	10.9	132
1934	50.3	13.3	130	1957	47.3	13.5	145
1935	45.9	8.1	136	1958	49.3	11.4	146
1936	46.9	17.2	117	1959	47.7	11.0	124
1937	45.3	15.9	140	1960	47.5	10.6	114
1938	47.0	17.4	149	1961	48.3	14.3	120
1939	46.9	10.0	126	1962	47.0	10.3	94
1940	49.0	16.2	158	1963	47.6	21.9	182
1941	46.8	17.8	160	1964	44.6	15.9	116
1942	44.4	15.8	112	1965	-	14.4	96
1943	47.1	10.6	120	1966	46.5	8.8	130
1944	45.0	15.9	115				
			Average		46.5	14.2	123.8
			Range		43.8-50.3	8.1-22.0	94-182

[3]U.S. Department of Commerce. 1922-66. Climatological Data, Idaho. U.S. Government Printing Office, Washington, D.C.

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1927	-	17.3	107	1950	46.5	16.3	116
1928	-	9.7	102	1951	45.6	16.3	101
1929	45.0	13.0	96	1952	46.2	11.0	132
1930	-	22.0	102	1953	48.9	10.6	131
1931	46.5	11.3	113	1954	48.5	10.5	119
1932	44.0	15.6	97	1955	47.2	18.7	117
1933	45.1	12.3	124	1956	47.0	10.9	132
1934	30.3	13.3	130	1957	47.3	13.3	145
1935	45.9	8.1	136	1958	49.3	11.4	146
1936	46.9	17.2	117	1959	47.7	11.0	124
1937	45.3	13.9	140	1960	47.5	10.6	114
1938	47.0	17.4	149	1961	48.3	14.3	120
1939	46.9	10.0	126	1962	47.0	10.3	94
1940	49.0	16.2	138	1963	47.6	21.9	182
1941	46.5	17.8	160	1964	44.6	15.9	116
1942	44.4	15.8	112	1965	-	14.4	96
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[1] U.S. Department of Commerce. 1922-66. Climatological Data, Idaho. U.S. Government Printing Office, Washington, D.C.

in origin[4] and are highly permeable. The BLM conducted a general soil survey on the area in 1962 and placed all the soils into two groups. Soils on steep rocky slopes are normally less than 20 inches in depth and are found on 30 percent or more slope. Irregular depths and textures also characterize this type. The second soil type is a deeper soil, usually 60 inches or more in depth, and is found in the canyon bottoms. This soil is much more uniform in texture and depth and does not exceed 5 percent slope.

Vegetation

The sagebrush-grass vegetation type comprises 70 percent of the total land area. Variation within this type extends from dense stands of big sage (Artemisia tridentata, subsp. vaseyana), with a limited understory, to nearly pure stands of bluebunch wheatgrass (Agropyron spicatum) (4 percent of the area) with scattered low sage (Artemisia arbuscula) and black sage (Artemisia nova). Bitterbrush (Purshia tridentata) is included in the sagebrush-grass type and is scattered throughout the unit, but with few exceptions, is not sufficiently abundant to be considered a dominant type. The mountain shrub type (Amelanchier alnifolia, Acer glabrum, Symphoricarpos oreophilus) occurs on 16 percent of the total area, quaking aspen (Populus tremuloides) occurs on 8 percent, Douglas fir (Psuedotsuga menziesii) occurs on 4 percent and juniper (Juniperus osteosperma) occurs on 2 percent.

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[4] U.S. Department of Interior. Bureau of Land Management. 1962. Oneida project. Unpublished report. Burley District, Idaho.

Wildlife

The Pleasant View Unit supports many species of game birds and animals. Game birds include ringneck pheasant, chukar and Hungarian partridge, mourning dove, sharp-tail grouse, blue grouse, and ruffed grouse. Mule deer is the primary big game species and an occasional elk is seen on the area.

Present Grazing Use of the Pleasant View Unit

The Burley District of the BLM administers grazing use on the area. The grazing season normally begins May 1 and continues through September 1, at which time 80 percent of the animals are removed. The remaining 20 percent stay two additional weeks. Eighty-two operators are licensed for 4,844 animal units and 17,438 animal unit months, with the average use being 4,280 AU's and 15,400 AUM's. The average grazing permit is 58 head, with 304 being the largest and 9 being the smallest. Most of the ranchers employ cow-calf ranching operations with the calves normally being born in February, March, and April. The Pleasant View Grazing Association requires one bull per 35 cows. The bulls are not allowed on the range until June 1.[5]

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[5] U. S. Department of Interior. Bureau of Land Management. 1968. Pleasant View Allotment Management Plan. Unpublished report. Burley district, Idaho.

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[5] U. S. Department of Interior. Bureau of Land Management. 1968. Pleasant View Allotment Management Plan. Unpublished report. Burley district, Idaho.

HISTORY OF THE PLEASANT VIEW UNIT

The first white men to arrive in the Malad Valley were trappers, sent by the St. Louis, Missouri Fur Company, in 1810. Only trappers and Indians visited the valley until 1849 when Captain Stansbury led an expedition through the area (Howell, 1960). Miners following the trappers, brought the first cattle into the valley, probably from Fort Hall in 1853. The valley was ideal for livestock grazing and as a result of high meat costs at the mines, many of the miners turned to raising cattle as a means of livelihood (Beal, 1959). Captain Stansbury referred to the highly productive ranges in 1849 when he wrote "The valley of the Malade is free from underbrush, with very little artemisia. Grass is abundant" (Howell, 1960). Beal (1959) also reported that scores of grasses and sedges flourished in the valleys and mountains and were "belly high" and so thick they could be cut for hay.

People living in northern Utah used the valley as a herding ground until 1855 when a colony of fifteen families settled on the east side of the Malad River. The settlement was broken up in 1858 because of Indian hostility and the threat of Johnston's Army (Howell, 1960). The first permanent settlement in the Malad Valley was established in 1863 when six men began farming (Beal, 1959). In 1864 Henry Peck and Judson C. Stoddard became partners forming the first permanent livestock business in the valley. At this time about 400 horses and some cattle were kept in Malad City (Howell, 1960).

Livestock numbers increased tremendously between 1850 and 1880. Beal (1959) reported that herds as large as 20,000 cows were familiar sights in the Fort Hall area. Curlew Valley, which is west of the Pleasant

HISTORY OF THE PLEASANT VIEW UNIT

View Unit, became a crossroad for sheep migrations from Nevada and Utah. The Curlew Valley suffered severely from repeated heavy spring use by the large bands of sheep driven through the area.[6] F. W. Ellis, when touring this area in 1898 wrote, "Mountains are renowned for their range grazing, myriads of sheep are driven from distant parts to feed and fatten on their nutritious grasses," (Howell, 1960). One Malad resident recalls more than 22,000 sheep being trailed from Nevada to summer ranges in the high mountains of northeastern Idaho and Wyoming. The "West Hills" (local term for the Pleasant View Range) were used for lambing and shearing (Marten and Carpenter, 1968). As farming increased, the cattle were also pushed into the mountains, some of them staying the year round[7] and some being brought home and fed alfalfa during the winter (Howell, 1960).

At the turn of the century approximately 15 operators were running nearly 21,000 sheep on the Pleasant View Unit. The season of use was from April 1 to June 1 and from October 1 to about December 15. During some years several bands wintered on the range.[8]

On December 22, 1905, a branch of the Oregon Short Line Railroad entered the Malad Valley from Corinne, Utah (Beal, 1959). At this time, the cattle industry was second only to farming in importance. Fifteen years after the railroad entered the valley, the population had doubled, and all phases of agriculture were stimulated (Howell, 1960).

With the heavy and continuous use from livestock, the range began to lose its productivity. Biographies of many old timers from Samaria[9]

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[6] U.S.D.I. 1962, op. cit.

[7] Ibid.

[8] Jones, Lawernce. 1968. Personal interview. Malad City, Idaho.

[9] A small community approximately 5 miles southeast of the Pleasant View Unit.

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6 U.S.D.I. 1962, op. cit.

7 Ibid.

8 Jones, Lawrence. 1958. Personal interview. Malad City, Idaho.

9 A small community approximately 5 miles southeast of the Pleasant View Unit.

indicate, that in the late 1800's, sagebrush became a problem. Two settlers in 1885 reported the brush as being very tall and thick (Howell, 1960) and had to be removed before farming (Marten and Carpenter, 1968). An account of range conditions on the Pleasant View Unit came from a Malad rancher when he said he could remember that in the 1930's there was much more pinegrass (probably Calamagrostis rubescens) under the trees than there is now. An article from the Malad newspaper in 1935 blamed overgrazing of range lands for propagating the white fly which was destroying sugar beets and also allowing Canadian thistle and mustard to infest areas.[10] The grazing season extended from April 15 to October 15 during this period. Some ranchers attribute the decline of range production during the 1930's to abnormal drought.

Although many ranchers sold wool for a profit as a result of World War I, the sheep industry was beginning to decline at this time. One of the last recordings of any large sheep business in the Malad Valley was in 1916 when William Davis bought and shipped several thousand sheep to Michigan for feeding (Marten and Carpenter, 1968). In 1935 all farm products, with the exception of wool, were selling for profits.[11] Sheep numbers between 1936 and 1940 for the state of Idaho dropped 385,000 (Schodde, 1940), as contrasted to a 42 percent increase for cattle in Oneida county between 1930 and 1935.[12]

Government control of grazing on the lands in this vicinity began

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[10] Idaho Enterprise Newspaper. 1935. Taylor Grazing Act makes many drastic changes. Malad City, Idaho. 3 Jan. 55:53.

[11] Idaho Enterprise Newspaper. 1935. Farm outlook is most encouraging says County Agent. Malad City, Idaho. 11 Apr. 56:53.

[12] Idaho Enterprise Newspaper. 1935. Farm Report Shows Oneida Crop Yields. Malad City, Idaho. 12 Dec. 56:25.

in 1934 with the passage of the Taylor Grazing Act. The Division of Grazing established by the Taylor Grazing Act, became the Grazing Service in August of 1939. In 1946 the Grazing Service was consolidated with the General Land Office to form the Bureau of Land Management (U.S. Department of Interior, 1962). Although regulations specified how the land would be used, limited manpower restricted proper land management.

In the 1960's the Pleasant View Unit clearly showed evidence of heavy past livestock use. Canyon bottoms were occupied by invading species in place of the original perennial grasses (Figures 2 and 3) and supported dense stands of invading weedy forb species. Hyoscyamus niger, a very poisonous plant, is common throughout the unit. Other invading forbs include Cynoglossum officinale, Capsella Bursa-pastoris, Lepidium perfoliatum, Polygonum spp., Cirsium vulgare, Helianthus annuus, and Lactuca spp. (For a complete list of all invading species, see Appendix A.) Ample evidence exists supporting Captain Stansbury's statement in 1849 that the valley had a little "artemisia." Figures 4 and 5 show dense stands of big sagebrush that has resulted from overgrazing on the Pleasant View Unit.

The initial step in planned management of the Pleasant View Unit began in 1965 when a range survey showed 58 percent more cattle than the forage could support. A 58 percent reduction in cattle use on Federal lands would have placed tremendous burdens on the majority of the ranchers since livestock is an integral part of the Malad Valley economy. Alternatives to the indicated reduction were explored. Working with A. L. Hormay from the Pacific Southwest Forest and Range Experiment Station, a rest-rotation system of grazing was designed for the Pleasant View Unit

Figure 2. Taraxacum officinale forms nearly 100 percent of the ground cover in many areas as shown here in West Elkhorn Canyon, June 26, 1967.

Figure 3. Several species of mustards, Descurainia, Lepidium, and Thlaspi, are common at lower elevation in the unit. This photograph was taken in Morgan Jones Canyon, July 11, 1968.

Figure 2. Tarweed officinale forms nearly 100 percent of the ground cover in many areas as shown here in West Elkhorn Canyon, June 25, 1967.

Figure 3. Several species of mustards, Descurainia, Lepidium, and Thlaspi, are common at lower elevation in the unit. This photograph was taken in Morgan Horse Canyon, July 11, 1968.

Figure 4. The fence separates range land (left) from native vegetation in with farm land (not grazed, at least during spring and summer months), Ireland Canyon, September 3, 1968.

Figure 5. The Pleasant View Unit (right) and private land (left) show differences in sagebrush density. Note the less dense stands of Artemisia on the area fenced in with the farm land, John Evans Canyon, September 9, 1968.

Figure 4. The fence separates range land (left) from native vegetation in with farm land (not grazed, at least during spring and summer months), Ireland Canyon, September 3, 1968.

Figure 5. The Pleasant View Unit (right) and private land (left) show differences in sagebrush density. Note the less dense stands of Artemisia on the area fenced in with the farm land, John Evans Canyon, September 9, 1968.

and included the following program:

1. No changes would be made in cattle numbers
2. The Pleasant View Unit would be fenced into six pastures
3. More water developments would be constructed
4. Each pasture would be permitted to go two consecutive years during the six-year period without being grazed
5. Each pasture would be grazed alternately in the spring and fall for the remaining four years.

At their 1965 meeting, the Pleasant View Livestock Association pledged their assistance and support to guarantee a fair trial for the proposed grazing system.[13] In 1966 the Pleasant View Unit was converted from continuous grazing to a six pasture rest-rotation system of grazing management.

Prior to the initiation of rest-rotation grazing, many new developments had to be made. Dividing the 70,780 acres into six pastures of nearly equal size required 68 miles of fences (Figure 1) and required two years for construction. Water has always been a major concern for cattlemen on the Pleasant View Unit, and with the further division of the unit into six pastures, the problem was compounded. Water existed at the Stump Canyon Springs, North Canyon Reservoir, Metcalf Hollow Reservoir, Sheep Creek, Wood Canyon Creek, and the Malad River. With the introduction of rest-rotation grazing, additional water developments were constructed at the Stump Canyon Springs (springs developed and channeled into a reservoir), Sheep Creek Springs (diesel engine installed that pumps water into troughs located in John Evans Canyon, West Elkhorn Canyon, and Morgan

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[13] U.S.D.I. 1968, op. cit.

Jones Canyon), and Wood Canyon Spring (springs developed and water piped to water troughs). In addition to these permanent water sources, water is hauled to troughs located in Ireland Canyon, North Canyon, John Evans Canyon, West Elkhorn Canyon, Morgan Jones Canyon, and Sublett Canyon.

The BLM sprayed and seeded 550 acres in Wood Canyon in 1965 to increase the forage production in pasture VI. The canyon bottom was seeded to intermediate wheatgrass (Agropyron intermedium). Quaking aspen stands in pastures I and VI were seeded to timothy (Phleum pratense) and orchardgrass (Dactylis glomerata) in the fall of 1966 and additional stands in pasture III were seeded in 1967. The canyon bottom in John Evans Canyon was sprayed in the spring of 1968 and is to be chained and seeded that fall. While fences and water developments were being constructed, many access roads were built. Two cattle guards were installed, one in Sublett Canyon and the other in Ireland Canyon.

LITERATURE REVIEW

Optimum range livestock production depends upon the interrelationships of the forage plants, the grazing animal and the manner in which the two are combined (grazing system). These interrelationships must be understood if sustained maximum production is to be expected from range lands.

Five factors are listed by Meyer, Anderson and Bohning (1966) as essential for plant growth. These are carbon dioxide, water, correct temperatures, light, and nutrients. During periods of growth, carbohydrates are produced in varying amounts, depending on the amount of photosynthetic tissue present, the availability of each growth requirement, and the stage of phenological development. Sugars that are not used in plant metabolism are stored in a cyclic manner in the roots and are used during subsequent growth periods (Stoddart and Smith, 1955).

Hormay (1967)[14] stated maximum storage occurs between one month and six weeks after the seed ripens, followed by a gradual decline until growth begins in the spring, then a rapid decline as a result of the initial spring growth. Approximately 75 percent of the winter reserves are used to produce 10 percent of the herbage growth (Stoddart and Smith, 1955). After this low point, carbohydrates are manufactured in excess of those used in metabolism and are stored until flowering begins (Figure 6). Again, a large demand is put on the reserve sugars for seed production and the reserve level declines. At completion of seed development, about six weeks after the seed is ripe, carbohydrate reserves increase to the

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[14] Notes taken at lecture presented by A. L. Hormay in Pocatello, Idaho, September, 1967.

LITERATURE REVIEW

Optimum range livestock production depends upon the interrelationships of the forage plants, the grazing animal and the manner in which the two are combined (grazing system). These interrelationships must be understood if sustained maximum production is to be expected from range lands.

Five factors are listed by Meyer, Anderson and Bohning (1960) as essential for plant growth. These are carbon dioxide, water, correct temperatures, light, and nutrients. During periods of growth, carbohydrates are produced in varying amounts, depending on the amount of photosynthetic tissue present, the availability of each growth requirement, and the stage of phenological development. Sugars that are not used in plant metabolism are stored in a cyclic manner in the roots and are used during subsequent growth periods (Stoddart and Smith, 1955).

Hormay (1967)[14] stated maximum storage occurs between one month and six weeks after the seed ripens, followed by a gradual decline until growth begins in the spring, then a rapid decline as a result of the initial spring growth. Approximately 75 percent of the winter reserves are used to produce 10 percent of the herbage growth (Stoddart and Smith, 1955). After this low point, carbohydrates are manufactured in excess of those used in metabolism and are stored until flowering begins (Figure 6). Again, a large demand is put on the reserve sugars for seed production and the reserve level declines. At completion of seed development, about six weeks after the seed is ripe, carbohydrate reserves increase to the

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[14] Notes taken at lecture presented by A. L. Hormay in Pocatello, Idaho, September, 1967.

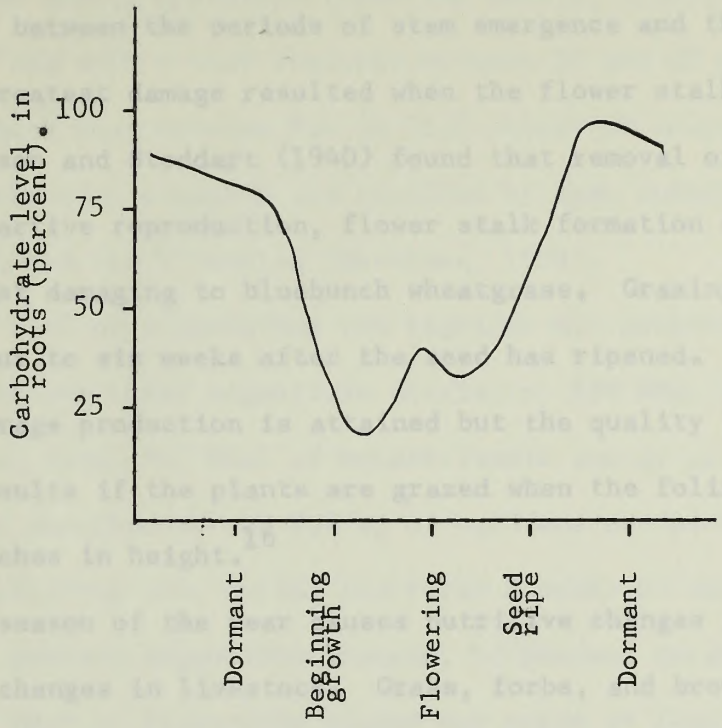

Figure 6. Generalized pattern of root reserve levels at various phenological stages.

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Of primary importance is the timing between grazing and the level of root reserves, especially over a period of years. Longevity and production of forage plants are directly related to the amount of stored carbohydrates at the various phenological stages and can be greatly reduced by improper timing of grazing. This complex problem of foliage removal and carbohydrate level is significant because it is the most important variable which man can control.

Grazing causes greatest injury when the foliage is removed during the periods of low reserves. Hormay found the greatest reduction in

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basal area of Idaho fesque (Festuca idahoensis) occurred when the plants were grazed between the periods of stem emergence and the peak of flowering. The greatest damage resulted when the flower stalks were two-thirds grown. Hanson and Stoddart (1940) found that removal of foliage during periods of active reproduction, flower stalk formation and spring growth were the most damaging to bluebunch wheatgrass. Grazing is least damaging if begun four to six weeks after the seed has ripened. At this time, greatest forage production is attained but the quality is low. Greatest regrowth results if the plants are grazed when the foliage is approximately three inches in height.[16]

The season of the year causes nutritive changes in forage and preference changes in livestock. Grass, forbs, and browse all decrease in protein content and increase in lignin and cellulose content as the growing season advances. Browse and forbs furnish ample protein and phosphorus late (August 10 to September 15) in the grazing season but are deficient in energy; the opposite is the case with grass species. Cattle prefer grass to forbs and browse throughout the grazing season and approximately 50 percent of their diet is grass. Forbs and browse each form about 25 percent of a cow's diet early (June 6 to July 15) and late in the grazing season. However, between July 16 and August 9 forbs comprise a much larger portion of the diet than does browse. Ranges with adequate quantities of grass, forbs, and browse are superior to those that are deficient in any one of these (Cook and Harris, 1968).

Nutritional requirements of cattle vary with age and reproductive

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[16] Ibid.

stage. Lactating cows require 25 percent to 30 percent more nutrients than do cows during gestation (Cook and Harris, 1968). A 900 to 1,000 pound beef cow with a calf requires between 22 and 27 pounds of dry matter per day, which must provide 9.6 to 12.0 therms of energy. In addition, thirteen essential elements are required by each animal, plus vitamins A, D, E, K, and the B complex (Morrison, 1959).

The diet of a gestating cow requires 4.4 percent digestible protein, 46 percent total digestible nutrients, 830 KCal of digestible energy per pound of feed, 665 KCal of metabolizable energy per pound of feed, .17 percent phosphorus, and 0.6 mg of carotene per pound of feed.

A lactating cow, during the first 8 weeks of nursing a calf, requires 5.4 percent digestible protein, 57 percent total digestible nutrients, 1120 KCal of digestible energy per pound of feed, 900 KCal of metabolizable energy per pound of feed, 0.22 percent phosphorus and 1.6 mg of carotene per pound of feed (Cook and Harris, 1968).

Several factors determine whether or not the daily nutritional requirements of a grazing animal is satisfied. The nutrients must be present in sufficient quantities in the forage, must be in an available form, and sufficient quantities of forage must be present.

Contrary to popular belief, cattle will not graze for longer periods as forage becomes less available and/or deficient in nutrients (Johnstone-Wallace, 1944). Hughes and Reid (1951) reported cattle would graze between 7.3 and 8.5 hours per day with an average of 7.9 hours. Voisin (1959) found that cattle would not graze more than 8 hours per day. The time a cow devotes to foraging is apparently genetically fixed as demonstrated by Voisin's (1959) and Johnstone-Wallace's (1944) studies where neither

acreage nor quantity of feed present affected the total time spent grazing. This is critical on ranges where cattle must devote more than eight hours to gather enough feed to satisfy physiological demands of the body. Willoughby (1958) suggested that less than 1400 pounds per acre of herbage (green weight) results in decreased weight gains because animals cannot gather an adequate quantity of forage.

Cattle are highly predictable creatures, in that they respond to situations in prognostic manners. Weaver and Tomanek (1951) found temperature influences location and distribution of cattle on any given day. Dwyer (1961) noted that cattle moved to water during hot days, especially with temperatures greater than 85 degrees. Milk production is adversely affected by high temperatures (Phillips, 1948). This is especially true with the European breeds (Hereford, Angus, and Shorthorn) because they do not have sweat glands and consequently have high metabolic rates (Ittner, Gilbert and Carroll, 1954).

Wind affects grazing habits, particularly during the hotter parts of the summer. Cattle tend to graze into the breeze (Weaver and Tomanek, 1951) or with their sides to the breeze (Dwyer, 1961). This may lead to overgrazing in certain parts of pastures. Ehrenreich and Bjugsted (1966) found that grazing time increased on hot days as wind velocity increased.

The degree to which topography limits animal movement would appear to depend on the availability of forage. As the forage on easily accessible areas decreases, steep slopes become less of a barrier. In addition to restricted movement, Dwyer (1961) found the herd size was smaller in rougher and steeper country.

Season of year also affects cattle behavior. Cattle tend to be

more scattered in the spring because it is calving time for some, breeding time for others, temperature is lower, flies are not bothersome, and new forage is not plentiful (Dwyer, 1961).

Daily cattle activities usually include 10 to 15 hours of rest, 5 to 8 hours of grazing per day, which includes some night grazing, and approximately 7.3 hours of ruminating (Hughes and Reid, 1951), and may or may not include drinking, depending on the temperature (Herbel and Nelson, 1966). Cattle normally will not go longer than 36 hours without salt (Dwyer, 1961). They do not necessarily seek salt after water (Cory, 1921).

Considerable research has been conducted on grazing systems in the past 60 years. The first experiments in the United States were prior to the turn of the century (Heady, 1967). Germany developed the Hohenheim system of rotational grazing near the turn of the century. This system placed the highest producing cows on each pasture first, followed successively by the less productive animals (Stoddart and Smith, 1955). Since that time numerous grazing studies have been conducted and have produced many different results.

Grazing systems can be grouped into four broad categories: continuous, deferred, rotational, and combinations of these. Continuous grazing, the most common method in the western states, allows livestock to graze the range at will for the duration of the grazing season. This method is employed because it is less time consuming and is less expensive (Stoddart and Smith, 1955).

Deferred grazing means delaying grazing until after the important species have produced seed. At least two pastures are required and the

deferment is then alternated between them. Stoddart and Smith (1955) stated that the two advantages to this method are the periodic resting which allows for seed maturation and the reduction of fire danger. Heady (1967) found that animal selectivity of plants is reduced under deferred grazing and this results in reduced quality of feed. This system was originally designed for ranges where plants cure well on the ground (Stoddart and Smith, 1955).

Rotational grazing involves dividing the range into units and grazing the units in a prescribed order. Hull, et at. (1965) found that with heavy stocking rates, rotational grazing increased crude protein in the forage. He also found that animal production per unit area increased with increased stocking rate as long as animals made reasonable gains in relation to maintenance requirements. Stoddart and Smith (1955) stated that more uniform use of forage as well as less forage loss from dung contamination resulted from this method of grazing. Bryant (1964) found animal production increased until about one-half of the feed was eaten, then production declined. Heady (1967) suggested such a system controlled lungworms, intestinal worms, but was not effective against ectoparasites, and that the stock were not able to be selective in grazing. Conversely, Rogler (1951) in North Dakota, when comparing a three pasture rotational system and continuous grazing, found yearling steers failed to gain as well under rotational grazing as under continuous grazing. After 25 years it was concluded that little benefit can be expected from rotational grazing except in emergency attempts to improve deteriorated range or where range forage is deficient. Hyder and Sawyer (1951) in Oregon in a three pasture rotational system employed from May 1 to October 1 showed contin-

uous grazing was best for cattle and vegetation. However, rotational grazing resulted in more uniformly grazed ranges. Hull, Meyer and Raguse (1967) showed that with heavy stocking rates on irrigated pastures, rotational grazing produced more animal days per hectare and more live weight gains per hectare, while continuous grazing showed greatest gain per hectare, greatest gain per hectare per animal day and greatest energy gain per hectare at moderate stocking rates. Spedding (1965) contends that under conditions of correct stocking there is little evidence for differences because of a different frequency of defoliation of individual plants in rotational versus continuous systems. There is evidence, however, that rotational grazing may be advantageous over continuous at high stocking rates. Black and Clark (1942), in South Dakota showed no advantage in steer gains or in range condition between rotation and continuous grazing. Stoddart and Smith (1955) stated most range experiments fail to show advantages to rotational grazing. However, many pasture studies and humid climate grazing experiments have shown distinct advantages.

Many researchers, as well as stockmen, have worked with the combinations of deferred and rotational grazing. These combinations assume many names such as rotation of deferred grazing, deferred rotation, rotated-deferment, and rest rotation (Anderson, 1967). Some investigators feel the advantages of both deferred and rotational grazing are obtained by combining the systems. A periodic rest is allowed for vigor restoration, seed formation, and establishment of seedlings. A. W. Sampson in 1913 recommended deferred-rotation management be the general practice on national forests (Heady, 1967). Hansen, et al. (1931) in a nine-year study in Colorado showed that the accumulated effect of deferred-rotation

grazing produced 53 percent more stems of desirable plants and 18 percent less stems of undesirable plants than did continuous grazing. Dillion and Wallenmeyer (1966) in Washington found deferred grazing increased AUMs from 1000 to 2310 between 1955 and 1965. Improvement came when grazing of bluebunch wheatgrass was stopped in May and June.

Heady (1961) after reviewing 35 separate experiments on the various grazing systems found only two studies showing decided advantages for deferred-rotation grazing. After reviewing seventeen different studies, this writer found that the results favored deferred grazing once, rotational grazing four times, continuous grazing four times, and no differences were observed between grazing systems in 8 studies. Finally, Spedding, in March, 1965, said no one system is superior to all others.

METHODS

The effects of converting a range from continuous grazing to rest-rotation grazing are apt to be numerous. Detecting change in the range is difficult without first having documented the range condition in the beginning. For this reason, much of the work conducted on the Pleasant View Unit during this study was descriptive. Rather than concentrating the research effort in a few areas, all the attributes of the Pleasant View Unit were studied but less intensively. It was hoped that by sampling all parts of the unit, areas could be selected that are most important for further study.

To describe and provide a base for detecting changes that might occur in the vegetation as a consequence of the change in management, several techniques were employed. The vegetation studies were designed to follow some of the dynamic attributes of the Pleasant View Unit such as frequency of occurrence (all species), forage production (grass species), juniper invasion and browse condition. Considerable effort was devoted to determining the variation that occurs in phenological development of plant species within years, between years, and between different species. Soil erosion was measured in a preliminary way. Animal studies involved cattle and deer (a small herd of deer spends the summer on the unit). Observations concerning deer location with respect to cattle location were made as well as cattle grazing habits and utilization patterns. Photographs were considered of utmost importance in describing the unit. In addition to establishing several permanent photoplots, many of the conditions that existed in all the other studies previously mentioned were documented with photographs.

METHODS

All data including plot descriptions and locations, soil measurements, vegetation measurements, and photographs, gathered during this study are filed at the BLM district office in Burley, Idaho and at the University of Idaho in the College of Forestry (Range Department), Moscow, Idaho.

Vegetation Methods

Photoplots were established at a number of locations to provide a visual record. Each photoplot was permanently located so that additional photographs could be taken at periodic intervals through the years.

Site selection for photoplots was based on the following criteria: (1) The site must be in a deteriorated condition with potential to improve and on an area that will receive enough grazing pressure to test the rest-rotation system, (2) the photoplot must contain a small amount of desirable plants or be very near a seed source of these plants. No restrictions on location were made according to range type as long as the photoplot met the previous requirements.

In establishing the plots to be photographed, criteria specified by the BLM were followed. A square frame, three feet on a side, was permanently positioned by placing two steel stakes in diagonal corners of the plot. A steel stake marked the position from which the photograph was taken. The photos were taken at approximately four feet above the photoplot with a 35 mm camera on Kodachrome II film. In addition to the photograph, the relative sizes, shapes, and locations of the perennial plants were plotted on forms provided by the Burley District of the BLM. A general photograph of the area and one of the photoplot were taken at each of the photopoint locations.

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Frequency of occurrence of all species and yield (pounds per acre) for grass species were sampled in key areas throughout the unit. Two, three, or four macro-plots (one acre in size) were established in each pasture and located according to range condition in big sagebrush or quaking aspen types. The sites selected represented areas demonstrating heavy past livestock use as shown by the frequency of invading annuals, but had deep fertile soils with promising potential.

Fifty circular 2.4 square-foot plots were systematically located by pacing from a designated starting point in a manner as shown in Figure 7.

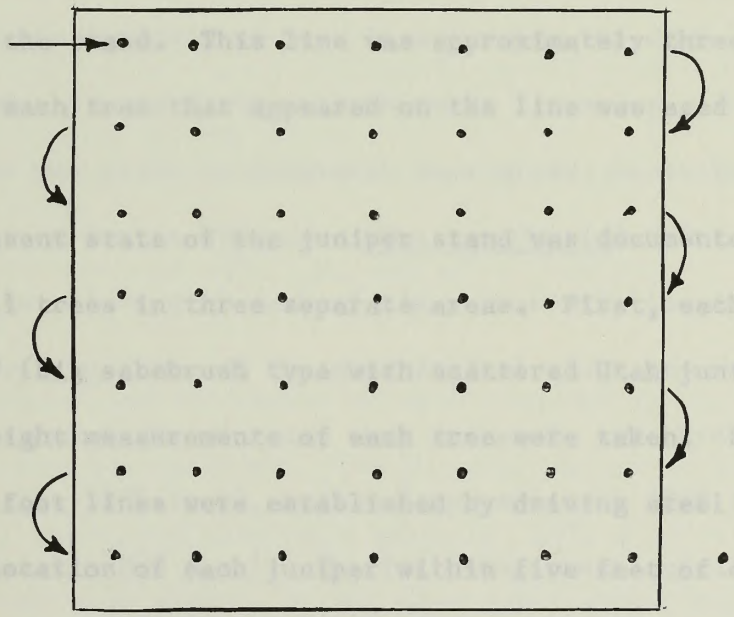

Figure 7. Plot distribution for determining frequency of occurrence for macro-plots.

The following information was obtained from the 2.4 square-foot plots at seed ripe time.

1. Seedling frequency of all grass species.
2. Frequency of all mature plants.

3. Yield of grass (estimated to the nearest five grams).

In addition, a plant list was made for each macro-plot area. Only plants in the immediate vicinity of the plot were listed. Each plant species was listed according to its generic and specific name.

Utah juniper (Juniperus osteosperma) appears to be invading portions of pasture V and this condition was studied. The first considerations were to verify that the trees were extending their range and to describe the present distribution in a manner that the invasion rate could be determined in later years if it occurred.

To ascertain invasion, trees were aged along an imaginary line running from the outer edge of the tree stand to a point directly toward the center of the stand. This line was approximately three-fourths of a mile long and each tree that appeared on the line was aged with an increment bore.

The present state of the juniper stand was documented by permanently locating all trees in three separate areas. First, each juniper inside macro-plot 4-V (big sabebrush type with scattered Utah juniper trees) was located and height measurements of each tree were taken. Secondly, two permanent 100 foot lines were established by driving steel pegs into the ground. The location of each juniper within five feet of either side of the line was recorded and its widest and narrowest diameters were measured. In addition both lines were photographed (the southern stake of both lines serves as the photopoint).

Bitterbrush and/or serviceberry (Amelanchier alnifolia) plants were permanently marked and located in pastures I, III, IV, and V where livestock use in the past had been heavy. These plants show the effects of

past heavy browsing, yet appear healthy enough to recover. The bitterbrush plants chosen are located in North Canyon, Morgan Jones Canyon, and Sublett Canyon. Four serviceberry plants were selected at the Sheep Creek exclosure, two inside and two outside, to compare non-use to rest-rotation grazing. The following information was obtained for each plant during the fall period of 1967 and 1968:

1. Maximum and minimum crown diameters.
2. The maximum height.
3. The shape (from above) of the plant was sketched on paper to provide a record for comparison.
4. Each plant was photographed with 35 mm Kodachrome II film.

During the summers of 1967 and 1968, the phenological development of many plant species was observed. Observations were made at random in 1967 and generally entailed no more than listing the date and location of each species when it was first noticed to be flowering. In 1968, particular attention was given to bluebunch wheatgrass, Kentucky bluegrass (Poa pratensis)and Nevada bluegrass (Poa nevadensis). One individual of each species was selected at each of six permanently located sites in pastures not being grazed and the phenological stage was recorded weekly. The sites represented two aspects, east and west, and three elevations, low (approximately 5000 feet), medium (approximately 6000 feet), and high (approximately 7000 feet). The following phenological stages were noted: leaves three inches long, stems low in the boot, stems emerging from the boot, flower stalks one-third grown, flower stalks two-thirds grown, flowering, seed in milk, seed ripe, and seed falling.

Soil

Erosion stakes were established in each pasture on areas that showed signs of erosion. One, two, or three stakes were set at each site and each

was individually identified and recorded. A large metal washer was placed on a spike and then the spike was driven into the ground until the washer set firmly against the spike head. The distance between the spike head and washer was measured and recorded each fall as an indication of soil loss.

Animal

Cattle activities in 1967 were observed at random in pasture II. This pasture was selected because John Evans Canyon (in pasture II) allows for unobstructed view from the bottom to the ridge on both sides, thus all sections of the slopes could be observed with field glasses. The following information was taken at intervals during the grazing season:

1. Location of the herds with respect to the slopes, i.e., on the bottom, on the lower one-third, on the middle one-third, on the upper one-third, or on the top.
2. The number in each herd.
3. The activity of the herd, i.e., watering, resting, walking, or salting.
4. The time of the observation, i.e., before 10:00 a.m., between 10:00 a.m. and 3:00 p.m. and after 3:00 p.m.
5. The weather at the time of the observation, i.e., clear, rain, etc.

The location and the number of deer observed at any time during the grazing season was recorded. The location refers to the pasture and whether or not cattle occupied that pasture. This study was intended to provide information on whether or not deer avoid areas used by cattle.

Uniformity of utilization in pastures I, V, and VI was estimated in 1968. This was accomplished by meandering (by foot or on horseback) across the pastures in a manner as to observe all drainages. Degrees of utilization were recorded in four general categories: very heavy use - no forage remaining; heavily used - some feed remaining; lightly used - considerable feed remaining; and slight to no use. This information was

placed on maps as the pastures were examined.

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RESULTS

Vegetation

Phenological Aspects of the Range

Optimum quantities of forage can be produced only if the range is grazed at the proper time. Calendar dates, presently the determinant for beginning and ending grazing seasons on federal land, are not closely related to the growth development of the range vegetation.

Variation in phenological development of the forage plants may be extensive, not only between years, but also within years (depending on the site) and between different species. The extent of the flucuation in plant development between years was demonstrated in 1967 and 1968 when the key plants developed approximately three weeks sooner in 1968 than in 1967. Bluebunch wheatgrass in 1968 flowered from 15 to 17 days earlier than it flowered in 1967 at the same location. Kentucky bluegrass flowered from 14 to 22 days earlier and Nevada bluegrass flowered about 25 days earlier in 1968 than in 1967.

Within a year, the phenological development will vary according to species, elevation, and aspect (Figures 8, 9, and 10). Nevada bluegrass developed to the seed ripe stage 14 days earlier than Kentucky bluegrass and 21 days sooner than bluebunch wheatgrass. The phenological development at lower elevations was 17 to 21 days ahead of development at the higher elevations for Kentucky bluegrass, 2 to 28 days for bluebunch wheatgrass, and 6 to 8 days for Nevada bluegrass. The elevational differences were approximately 2000 feet. Different slope aspects produced varying developmental rates, but not as is normally expected, i.e. south sloped usually developing before north slopes, and west slopes before east

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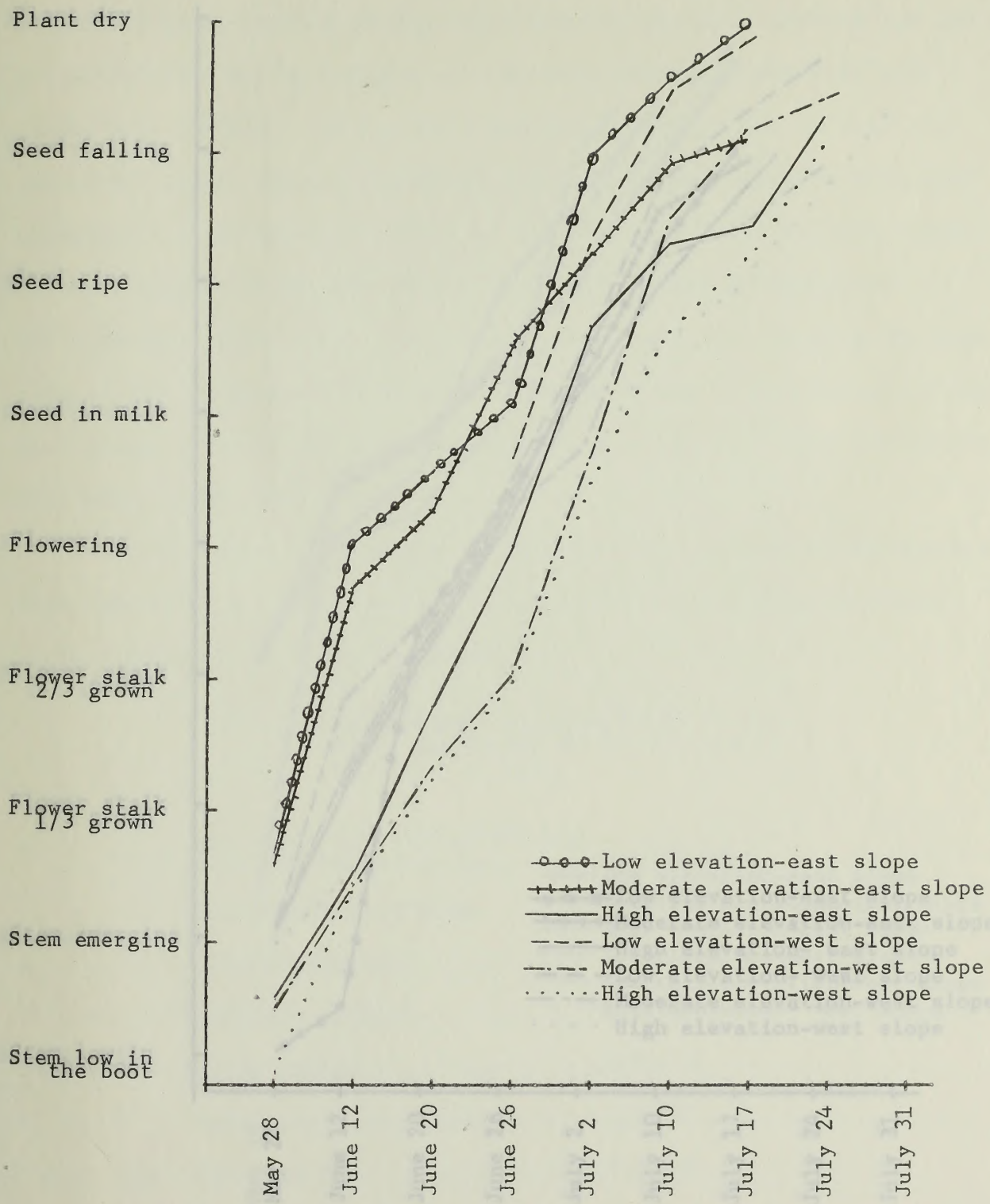
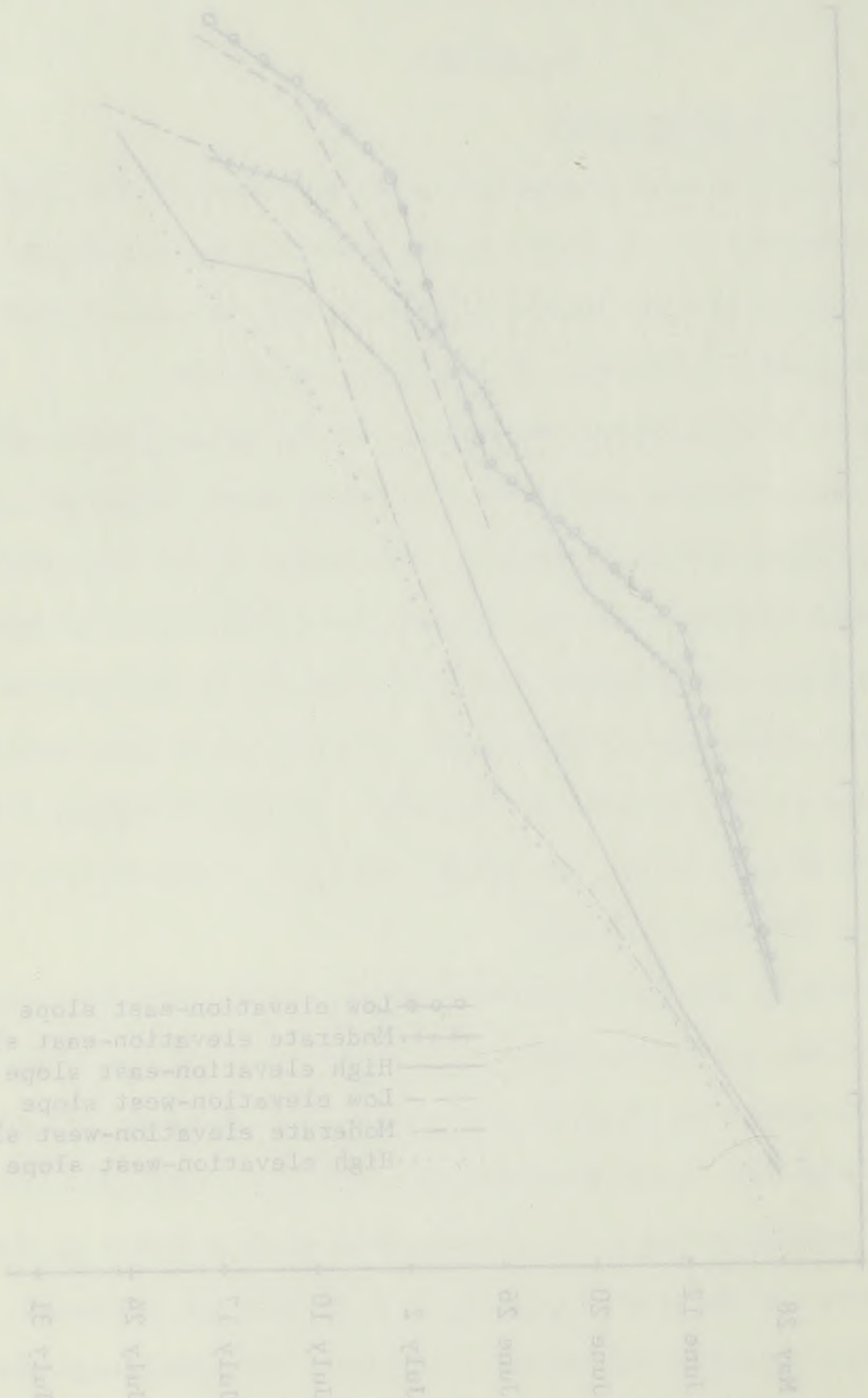


Figure 8. The influences of aspect and elevation on the phenological development of Kentucky bluegrass on the Pleasant View Unit during the summer of 1968.



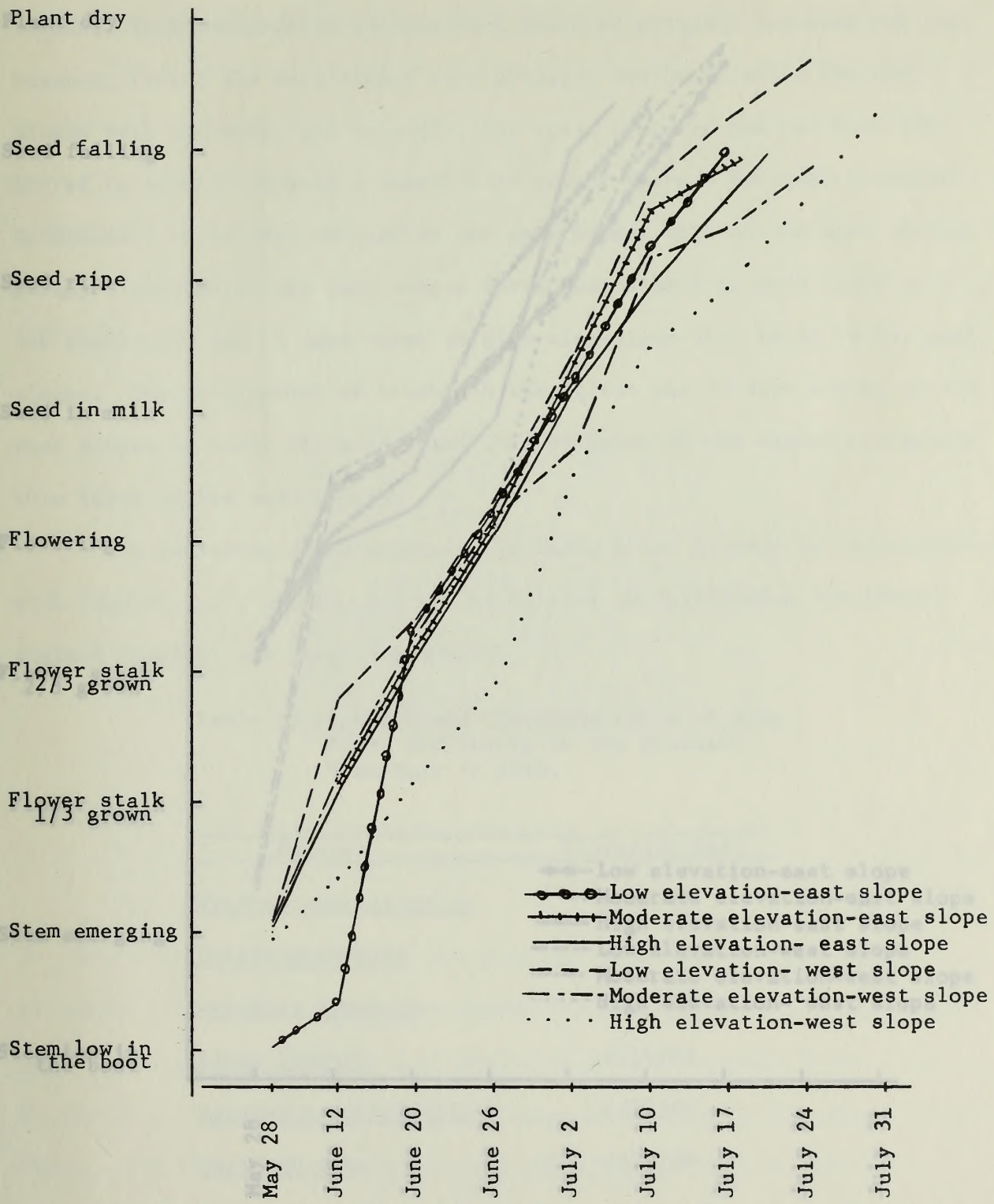


Figure 9. The influences of aspect and elevation on the phenological development of bluebunch wheatgrass on the Pleasant View Unit during the summer of 1968.

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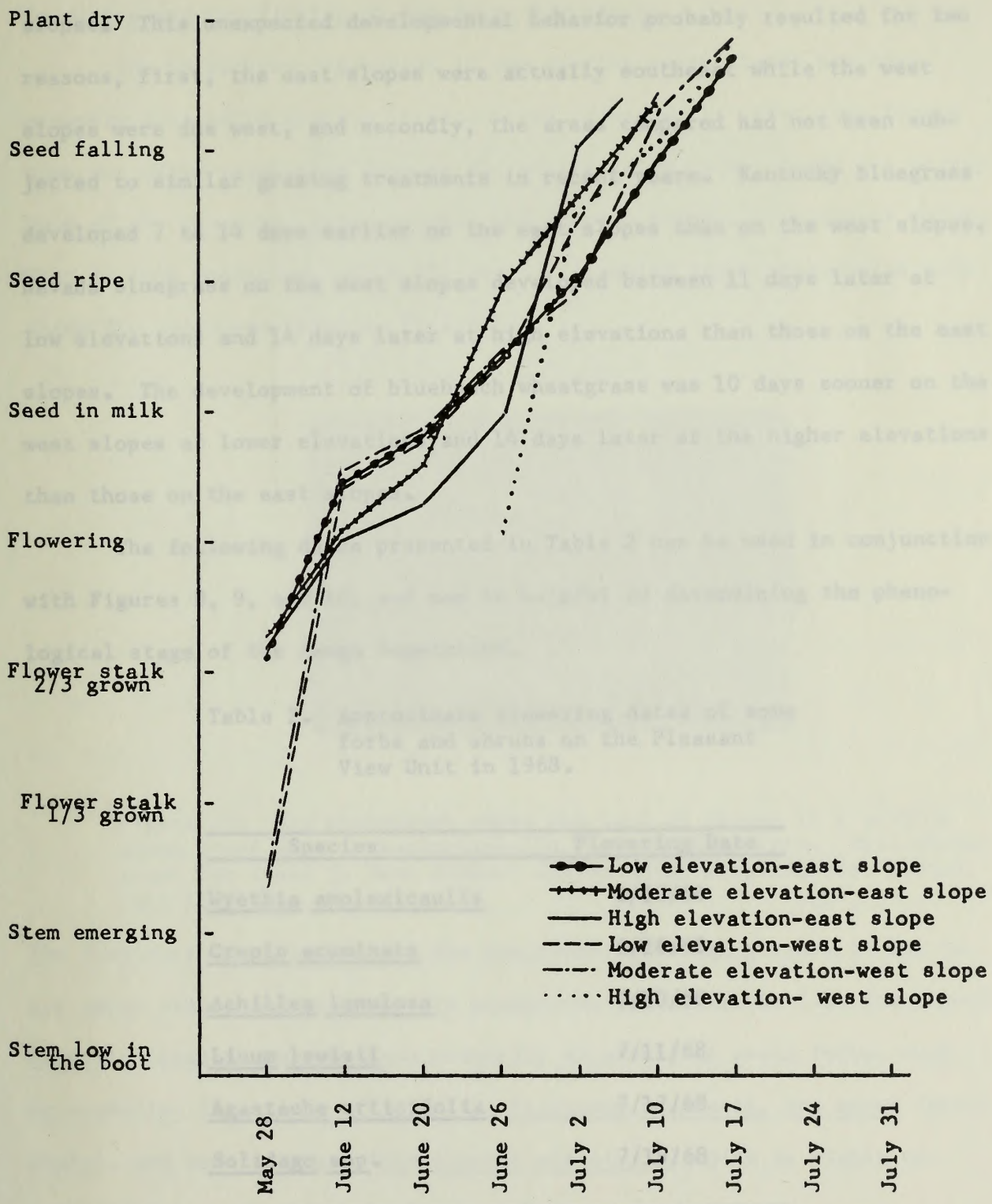

Figure 10. The influences of aspect and elevation on the phenological development of Neveda bluegrass on the Pleasant View Unit during the summer of 1968.

Figure 10. The influences of aspect and elevation on the phenological development of Nevada ginegrass on the Pleasant View Unit during the summer of 1958.

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The following dates presented in Table 2 can be used in conjunction with Figures 8, 9, and 10, and may be helpful in determining the phenological stage of the range vegetation.

Table 2. Approximate flowering dates of some forbs and shrubs on the Pleasant View Unit in 1968.

Species	Flowering Date
Wyethia amplexicaulis	6/20/68
Crepis acuminata	6/26/68
Achillea lanulosa	7/10/68
Linum lewisii	7/11/68
Agastache urticifolia	7/17/68
Solidago spp.	7/19/68

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Condition and Description of the Range Vegetation

The herbaceous vegetation in the quaking aspen stands has been severely altered by grazing livestock and consequently offer less forage than any other vegetation type on the entire unit. Such stands are nearly void of any perennial grass species and support primarily prostrate forbs. When in this condition, the 8,493 acres of quaking aspen contributes only shade for livestock (Figures 11 and 12).

Figure 11. The photograph shows the lack of forage in a quaking aspen stand that characterizes the Pleasant View Unit. This photograph was taken in West Elkhorn Canyon after a spring rest period, July 11, 1968.

The frequency of occurrence of the desirable perennial grasses is low in all aspen stands and consequently production is low (Table 3). The ground cover in these stands consists primarily of prostrate weedy forbs, such as dandelion (Taraxacum officinale), Polygonum douglasii, Poa annua (prostrate), and hounds-tongue (Cynoglossum officinale)(which is highly unpalatable).

To improve the depleted aspen stands, the BLM has attempted seeding these stands in the fall with orchard grass and timothy. Such action has

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The frequency of occurrence of the desirable perennial grasses is low in all aspen stands and consequently production is low (Table 3). The ground cover in these stands consists primarily of prostrate weedy forbs, such as dandelion (Taraxacum officinale), Polygonum douglasii, Poa annua (prostrate), and bounds-tongue (Cynoglossum officinale)(which is highly unpalatable).

To improve the depleted aspen stands, the BLM has attempted seeding these stands in the fall with orchard grass and timothy. Such action has

Figure 12. Typical surface cover in quaking aspen stands on Pleasant View Unit, Sheep Creek, July 11, 1967.

definitely increased the frequency of perennial grasses in the seeded areas. Pinegrass was the most abundant grass in the aspen stand sampled in West Elkhorn (macro-plot 3-III) in 1967 with a frequency of 20. In the fall of 1967 this plot was seeded and, when sampled in 1968, orchardgrass was the most frequent grass, being found in 84 percent of the plots. Figure 13 shows an area similarly seeded in 1966. Aspen stands in North Canyon (macro-plot 2-I) and Wood Canyon (macro-plot I-VI) were seeded prior to the establishment of the macro-plots and showed the frequency of orchardgrass to be 66 and 84 respectively. Macro-plot 1-VI produced 617 pounds of green foliage in 1968. This value would have been larger had the cattle entered the pasture after the plants matured. (Phenological development is slower than the key species, Nevada bluegrass and bluebunch wheatgrass.) Even with the increased frequency of the seeded species, the existing forbs have remained as frequent as before. These, however, should decline as the grass stand becomes established.

Figure 12. Typical surface cover in quaking aspen stands on Pleasant View Unit, Sheep Creek, July 11, 1967.

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Table 3. The frequency of occurrence of the most common plants on the Pleasant View Unit and the production (pounds per acre of green weight) of all grass species. The data were taken from the macro-plots sampled during the summers of 1967 and 1968

Species	Macro-plots													
	1-I canyon bottom		2-I fir-aspen stand		1-II aspen stand		2-II sagebrush stand		3-II sagebrush stand		4-II sagebrush stand		1-III sagebrush stand	
	frequency	production	frequency	production	frequency	production	frequency	production	frequency	production	frequency	production	frequency	production
Arnica cordifolia					32									
Artemisia tridentata	4						54		64		40			
Capsella Bursa-pastoris													16	
Chrysothamnus spp.							14		26		32		4	
Cirsium vulgare	10		4		28				8					
Collinsia parviflora					48									
Cynoglossum officinale	12		10		66				4		4		4	
Lactuca sp.	4		4		16				14		10		2	
Polygonum douglasii	90		4		56		2		4		4		2	
Taraxacum officinale	94		18		84		12		36		30		66	
Veronica arvense									4		4		4	
Agropyron spicatum														
Bromus japonicus							84	208	72	61				
Bromus tectorum					18	10	18	27			98	591	94	585
Calamagrostis rubescens			32	*	6	6								
Carex geyeri			6	*	28	25								
Dactylis glomerata	56	*	66	*										
Phleum pratense	2	*	16	*			4	32						
Poa annua	2	*			8	3								
Poa longiligula														
Poa nevadensis							16	34	2	1	28	62	22	44
Poa pratensis	22	*			22	77			58	268			16	50
Poa secunda							2	4			20	30		
Other spp.		*		*		8		108				5		13
Total Grass Production		*		*		183		413		330		688		692

*Quantity of the grass species was not sampled because the pasture had been grazed prior to sampling.

tion (pounds per acre of green weight) of all grass species. The data were taken from the
macro-plots sampled during the summers of 1967 and 1968

Species	Macro-plots															
	1-I Canyon bottom		2-I Fir-aspen stand		1-II Aspen stand		2-II Sagebrush stand		3-II Sagebrush stand		4-II Sagebrush stand		1-III Sagebrush stand	
	Frequency	Production	Frequency	Production	Frequency	Production	Frequency	Production	Frequency	Production	Frequency	Production	Frequency	Production
Arnica cordifolia					32									
Artemisia tridentata							54		64		40			
Capsella bursa-pastoris													16	
Chrysothamnus spp.							14		26		32		4	
Cirsium vulgare	10	4			28				8					
Collinsia parviflora					48									
Cynoglossum officinale	12	10			66				4		4		4	
Lactuca sp.	4	4			16				14		10		2	
Polygonum douglasii	30	4			56		2		4		4		2	
Taraxacum officinale	94	16			84		12		36		30		66	
Veronica arvense									4		4		4	
Agropyron spicatum														
Bromus japonicus							84	208	72	61				
Bromus tectorum					18	10	18	27			98	591	94	585
Calamagrostis rubescens			32	*	6									
Carex geyeri			6	*	28	25								
Dactylis glomerata	56	*	66	*										
Phleum pratense	2	*	16	*			4	32						
Poa annua	2	*			8	3								
Poa longiligula														
Poa nevadensis							16	34	2	1	28	62	22	44
Poa pratensis	22	*			22	77			58	268			16	50
Poa secunda							2	4			20	30		
Other spp.		*		*		8		108				5		13
Total Grass Production		*		*		183		413		330		688		692

*Quantity of the grass species was not sampled because the pasture had been grazed prior to sampling.

Table 3 (continued).

Species	Macro-plots													
	2-III sagebrush stand		3-III aspen stand		4-III sagebrush stand		1-IV sagebrush stand		2-IV sagebrush stand		3-IV bitterbrush stand		1-V canyon bottom	
	frequency	production	frequency	production	frequency	production	frequency	production	frequency	production	frequency	production	frequency	production
Arnica cordifolia			54											
Artemisia tridentata	40				30		70		42		30		44	
Capsella Bursa-pastoris							42							
Chrysothamnus spp.	60				18		2		22		32		36	
Cirsium vulgare	4				2		2				4			
Collinsia parviflora	2		74											
Cynoglossum officinale			6		8		2						12	
Lactuca sp.	4		8		10		30		2				2	
Polygonum douglasii			24				36		32		2		34	
Taraxacum officinale			40				84						2	
Veronica arvense	8		2										46	
Agropyron spicatum	4	32			4	16			56	60	60	80	2	4
Bromus japonicus	2	1											2	1
Bromus tectorum	72	64			94	208	60	56	72	32	64	27	80	80
Calamagrostis rubescens			10	14										
Carex geyeri			4	3			2	2	4	5				
Dactylis glomerata			84											
Phleum pratense														
Poa annua														
Poa longiligula									1	4			6	25
Poa nevadensis			2	4					16	20				
Poa pratensis							42	316	2	8				
Poa secunda	46	38							52	30	33	40		
Other spp.		8				54		27		22				14
Total Grass Production		143		21		278		401		181		147		124

Table 1 (continued).

Species	Macro-plots															
	2-III		3-III		4-III		1-IV		2-IV		3-IV		4-V			
	seedgrush stand		seedgrush stand		seedgrush stand		seedgrush stand		seedgrush stand		seedgrush litterbrush stand					
	frequency	biomass	frequency	biomass	frequency	biomass	frequency	biomass	frequency	biomass	frequency	biomass	frequency	biomass	frequency	biomass
Arnica cordifolia			56													
Artemisia tridentata	40				30		70		42		30		44			
Capsella bursa-pastoris							42									
Chrysothamnus spp.	60				18		2		22		32		36			
Cirsium vulgare	4				2		2				4					
Collinsia parviflora	2		74													
Cynoglossum officinale			6		8		2						12			
Lactuca spp.	4		8		10		30		2				2			
Polygonum douglasii			24				36		32		2		36			
Taraxacum officinale			40				84						2			
Veronica arvensa			8		2								46			
Agropyron spicatum	4	32					4	16			56	60	60	80	2	4
Bromus japonicus	2	1													2	1
Bromus tectorum	72	64			94	208	80	56	72	32	64	27	80	80		
Calamagrostis rubescens			10	14												
Carex geyeri			4	3			2	2	4	8						
Deschylia glomerata			84													
Phleum pratense																
Poa annua																
Poa longiligula									1	4			6	25		
Poa nevadensis			2	4					16	20						
Poa pratensis							42	216	2	8						
Poa secunda	46	36							52	30	32	40				
Other spp.	8				56		27		22						14	
Total Grass Production	163		21		278		608		183		142		124			

Table 3 (continued).

Species	Macro-plots													
	2-V serviceberry stand		3-V aspen stand		4-V sagebrush stand		1-VI aspen stand		2-VI sagebrush stand-sprayed		3-VI sagebrush stand		4-VI canyon bottom	
	frequency	production	frequency	production	frequency	production	frequency	production	frequency	production	frequency	production	frequency	production
Arnica cordifolia														
Artemisia tridentata	30				14		20				76		20	
Capsella Bursa-pastoris	20													
Chrysothamnus spp.	6				46									
Cirsium vulgare	10		24		6		34							
Collinsia parviflora			34											
Cynoglossum officinale	22		16				84		6		16		76	
Lactuca sp.	32				24		54		78		58		38	
Polygonum douglasii	52		78				46		26		26		60	
Taraxacum officinale	70		84				94		8		2		92	
Veronica arvense	58		66		58		68		54		18		24	
Agropyron spicatum					14	40								
Bromus japonicus					2	1			4	2				
Bromus tectorum	58	92	4	4	90	92	8	6	100	900	90	100	82	728
Calamagrostis rubescens			2	1										
Carex geyeri	30	25	2	1			2	1						
Dactylis glomerata							84	608					18	38
Phleum pratense							78	a					8	16
Poa annua	4	5	8	21										
Poa longiligula														
Poa nevadensis					2	8								
Poa pratensis	6	36	2	5			4	2	8	40	10	22	12	34
Poa secunda	2	1												
Other spp.		58		6		64		1		4		51		
Total Grass Production		262		38				618		946		173		816

[a] Included with Dactylis glomerata

Macro-plots

Species	2-V serviceberry stand		3-V aspen stand		4-V aspen/spruce stand		1-VI aspen stand		2-VI aspen/spruce stand-sprayed		3-VI aspen/spruce stand		4-VI canyon bottom	
	Abundance	Production	Abundance	Production	Abundance	Production	Abundance	Production	Abundance	Production	Abundance	Production	Abundance	Production
Artica cordifolia														
Artemisia tridentata	30			14			20				76		20	
Capsella-Bursa-pastoris	20													
Chrysothamnus spp.	6			46										
Cirsium vulgare	10	24		6			34							
Collinsia parviflora		34												
Cynoglossum officinale	22	16					84		6		16		76	
Lactuca sp.	32		24				54		78		58		38	
Polygonum douglasii	52	78					46		26		26		60	
Taraxacum officinale	70	84					94		8		2		92	
Veronica arvense	38	66		58			68		34		18		24	
Agropyron spicatum					14	40								
Bromus japonicus					2	1			6	2				
Bromus tectorum	58	92	4	4	90	92	8	6	100	900	90	100	82	728
Calamagrostis tubaeana			2	1										
Carex geyeri	30	25	2	1			2	1						
Dactylis glomerata							84	608					18	38
Phleum pratense							78	a					8	16
Poa annua	4	5	8	21										
Poa longiligula														
Poa nevadensis					2	8								
Poa pratensis	6	36	2	5			4	2	8	40	10	22	12	34
Poa secunda	2	1												
Other spp.		58		6		64		1		4		51		
Total Grass Production		202		38				618		946		173		816

[a] Included with Dactylis glomerata

Figure 13. Area seeded with orchardgrass and timothy in Wood Canyon in 1966. Photo was taken July 10, 1968.

The initial results of seeding quaking aspen stands appears promising, but the longevity of these stands is still in doubt. Those plants growing in the shade of trees have failed to produce seed in either 1967 or 1968. It appears that the shade slows the phenological development considerably and prevents seed formation. Neither orchardgrass nor timothy is rhizomatous and consequently depend on seed for reproduction.

Characteristic of the canyon bottoms are the dense stands of big sagebrush which occupy very productive sites, yet produce a minimum of forage (Figure 14). Cheatgrass (Bromus tectorum) and Japanese brome (Bromus japonicus) are the most frequent grass species in these areas and often have frequencies approaching 100 (Table 3). Kentucky bluegrass appears to be the best adapted perennial grass and is able to survive in

Figure 13. Area seeded with orchardgrass and timothy in Wood Canyon in 1966. Photo was taken July 10, 1968.

Figure 14. Typical big sagebrush stand found in many canyon bottoms, Sublett Canyon, August 14, 1967.

these sagebrush stands. Other grasses, Agropyron spp. and Stipa spp. are found on the canyon bottom but are scattered and do not produce large quantities of forage. On the hillsides, the sagebrush is less dense, and more perennial grasses are present. Often forbs form the dominant vegetation, especially in highly disturbed areas and/or in the openings amongst tree stands. Here dandelion, Polygonum, and hounds-tongue characterize all such areas with high frequencies. Again cheatgrass is the most frequent grass species while Kentucky bluegrass is the most frequent perennial grass.

The sagebrush in the bottom on John Evans Canyon was sprayed in the spring of 1968 and included macro-plots 2-II, 3-II, and 4-II. An excellent opportunity to evaluate the effects of the spraying and the chaining and seeding was presented. Macro-plot 4-II produced 92 pounds (green) of perennial grass in 1968 and will be the only plot that will be drilled. Macro-plots 2-II and 3-II are not likely to be seeded but the spray-release effects can be evaluated. Macro-plot 2-II has a good seed

Figure 14. Typical big sagebrush stand found in many canyon bottoms, Sublette Canyon, August 14, 1967.

source (six perennial grass species present on the site), but produced only 178 pounds of green forage per acre in 1968. Macro-plot 3-II has a good stand of Kentucky bluegrass, frequency of 58, but supplied only 268 pounds of green forage per acre. These three plots should be sampled in 1970 at seed ripe time and the results compared with the previous production values. This should provide data either supporting or discouraging further spray-release and/or spray-reseeding improvements.

Shrubs, mainly big sagebrush with snowberry (Symphoricarpos oreophilus), rabbitbrush (Chrysothamanos spp.), serviceberry, bitterbrush, chokecherry (Prunus virginiana) and juniper form the dominant cover on the hillsides. The understory contains large amounts of annual grasses and invading forbs on the lower slopes. As the distance from the bottom increases, perennial grasses (bluebunch wheatgrass and Poa spp.) and native forbs become more predominant. In addition, big sagebrush decreases with increased distance from the bottoms.

Serviceberry and bitterbrush produce substantial quantities of forage on the Pleasant View Unit but not as much as in years past. It appears that many of the large pure stands of big sagebrush once contained serviceberry and bitterbrush (Figure 15). Many of these browse plants have been eliminated from the range, because they are preferred by livestock and because after the herbaceous plants are eaten, the shrubs provide the only feed.

In September of 1968, most of the serviceberry plants in pasture V appeared to be dying. Further investigation showed an insect was boring into the stems and severing the woody fibers. Neither the identity nor the extent of this infestation is known. The area of greatest infestation

Figure 15. The fence separates the Pleasant View Unit (right) from adjacent farm land (left). Note the reduced density of serviceberry at the mouth of Morgan Jones, August 15, 1968.

was within a one-half mile radius around the Sheep Creek Exclosure.

Juniper trees appears to be invading parts of pasture V. This was verified by aging the trees in the outer parts of the stand. The youngest trees were found on the outskirts of the stand and progressively older trees were found toward the center of the stand. This indicates that new trees are occupying previously unoccupied areas (Figure 16). Presently there are not enough trees nor are they dense enough to affect forage production. Yet the stand is invading new areas and may eventually reduce the carrying capacity, especially in pasture V.

It appears that forage production in the canyon bottoms can be greatly increased by killing the woody species (big sagebrush) by spraying alone if desireable grasses are plentiful enough to provide a seed source.

Figure 16. Invading Juniperus osteosperma trees in pasture V, September 4, 1968.

Approximately 550 acres of sagebrush were sprayed and seeded in pasture VI. Several acres that are adjacent to this treated area received some drift from the spray but did not receive the chaining nor the seeding. These border areas provided an excellent opportunity to evaluate the effect of the spraying on the release of grasses and other herbaceous species. Ten 9.6 square-foot plots were systematically located across the spray area and 10 plots were located across the untreated area (Figure 17). The spray killed the big sagebrush but not the bitterbrush nor rabbitbrush. There was a good source of grass seed present and with the three years of rest that followed, the native species responded spectacularly. Grass production from the sprayed area was 1270 pounds of green weight per acre and production from the non-treated area was only 204 pounds. There was not a large difference in the kinds of plant species occupying the two areas, but the productivity of the species varied greatly. Bluebunch wheatgrass increased 624 pounds per acre on the

Figure 16. Invading Juniperus osteosperma trees in pasture V, September 4, 1968.

Figure 17. The area in the immediate foreground was sprayed, the area across the fence (right) was not treated, and the area in the center and to the right was sprayed and seeded, Mouth of Wood Canyon, June 28, 1968

sprayed area. June grass (Koeleria cristatum)increased 259 pounds per acre and big sagebrush decreased 650 pounds per acre (Figures 18 and 19).

Figure 18. Non-sprayed area in Wood Canyon, 1968. Note the abundance of woody plants, June 28, 1968.

Figure 17. The area in the immediate foreground was sprayed, the area across the fence (right) was not treated, and the area in the center and to the right was sprayed and seeded, South of Wood Canyon, June 28, 1968

sprayed area. June grass (Koeleria cristatum) increased 259 pounds per

ce and big sagebrush decreased 650 pounds per acre (Figures 18 and 19).

Figure 18. Non-sprayed area in Wood Canyon, 1968. Note the abundance of woody plants, June 28, 1968.

Figure 19. Sprayed area in Wood Canyon, 1968. Note the quantity of grass produced, June 28, 1968.

Soil Movement

Erosion does not present a serious problem on the Pleasant View Unit. Most of the precipitation falls in winter in the form of snow. The canyon bottoms are wide, at least in places, and thus much of any excess water from spring runoff or heavy rains is dispersed rather than channeled. In addition to these factors, reservoirs exist in several canyons and slow runoff. The soil on the area is highly permeable as demonstrated by the many reservoirs that are unable to retain water.

Rainfall was great enough on two occasions during this study to result in runoff and erosion. However, the soil that was moved came primarily from adjacent farmland as did the bulk of the runoff water.

Twenty-four erosion stakes placed throughout the unit in areas likely to erode showed little soil movement. Two stakes, each placed on non-vegetated slopes, showed excessive soil loss. Other than these two, only 10 showed any soil movement, the largest amount being one-fourth

Figure 19. Sprayed area in Wood Canyon, 1968. Note the quantity of grass produced, June 28, 1968.

inch as measured on the stake. Nine stakes indicated no movement, two were slightly covered, and one stake could not be relocated.

The greatest difficulty with erosion stakes is that they are apt to get stepped on by grazing animals. If this study is to continue, the stakes will have to be reset each year and can be used only in pastures not being grazed. However, the six stakes in the West Elkhorn exclosure are not susceptible to trampling and need not be reset yearly.

Animals

Factors Affecting Calf Production

The production of calves is the most important multiple-use value produced from the Pleasant View Unit. There is reason to believe that the present range situation is not adequate for optimum calf production.

The total production of calf weight produced on the unit is greater when the calves are born prior to the spring turn-out date. Many Pleasant View ranchers stated that more of their cows are calving later in the year (summer months) than before rest-rotation grazing. The extent of the late calving was examined on September 9, 1968. On that day, 304 calves were observed and of these, only 191 (59 percent of the total) had been branded or ear marked (branded and ear marked calves generally indicate those born before moving onto the range). Fifty-nine percent may be high as many ranchers ear mark during the summer on the range as they see new born calves. In actuality, the percentage born on the range probably approaches fifty percent. The economic importance of late calving is demonstrated by Wiltbank (1968) who stated that for each 80 days that a calf is born late, it can be expected to weigh 100 pounds less at weaning.

In addition to late calving, there were a few reports from

the ranchers that the percent of calf crop has also decreased since changing grazing systems. One rancher said he normally obtained an 85 percent calf crop prior to rest-rotation grazing, but during the first year of the new system, it had declined to 50 percent, and in 1967 had increased to 65 percent. This could possibly be attributed to the cattle being placed in a strange area. Regardless of the reason, Wiltbank (1968) states that a decrease of 10 percent in calf crop in a herd of one hundred head results in a loss of 4,500 pounds of calf!

When a cow calves during the summer months (June, July, or August) it means she was not bred on the range but rather was bred after she was taken home. One or any of a combination of factors could possible account for this late calving. Only one bull per 35 cows is required by the Pleasant View Cattle Association and some ranchers feel this is inadequate, especially when the bulls are withheld from the range until June 1. Compounding this problem are the ranchers that remove their bulls from the range prematurely or those that are not fulfilling the original requirement.

A rancher from southwestern Idaho, while aiding in mapping forage utilization, was very impressed with the scarcity of bulls that he saw during two days of riding the range. Too often herds are noticed without a bull, while others are observed having as many as ten bulls. Boice (1966) stated that when two bulls are together one of them is being wasted and this is commonly true on the Pleasant View Unit.

There is also a strong possibility that the cows are not being bred on the range because of energy deficiencies. The following statements presented by Wiltbank in 1968 may help explain the relationship

between reproduction and the plane of animal nutrition. The level of energy consumed, both before and after calving, affects the pregnancy rate of a beef cow herd by affecting the time which a cow first shows heat after parturition and also influences the cows that conceive after one service. Cows should not lose weight after calving if a high proportion of the cows are expected to conceive with the first service. This is a very important point because of the early opening date on the Pleasant View Unit. Early in the spring, cattle find only a limited amount of forage on the range, especially at the higher elevations. Those cows that calved before going onto the range, but had not been bred, are likely not to be bred until later in the summer or fall. Once a cow calves late in the summer, she is not apt to calve in the spring again unless she skips one calf.

Cows, for a variety of reasons, are constantly getting into the rest pastures. As many as fifty head were counted in Wood Canyon in 1967 and 41 in West Elkhorn Canyon in 1968 plus numerous smaller herds scattered throughout the "rest" pastures. These cows are separated from the bulls and will not be bred until leaving the range in the fall. The number of isolated cows need not be large in any one year in order for this to become extremely important in a few years.

Young cows are more apt to show heat later after parturition than older cows. Wiltbank (1968), working with beef cows, found that within 40 days after parturition, 56 percent of the five-year-old cows, 26 percent of four-year-old cows, and only 14 percent of the three-year-old cows had shown heat. One Pleasant View rancher stated that he had 17 "second calf heifers" go all summer without being bred, and other ranchers

also voiced their concern over low conception rates in "second calf heifers."

Another reason for late calves is because the cows calved late the previous year. This is an accumulative process and the number of late calves will continue to increase unless this problem receives some attention by the ranchers involved.

The location of the fences on the Pleasant View Unit has probably caused some reduction in calf production. The fences separating the pastures are all on ridge tops and the locations of the gates are unknown by the cattle. Therefore, it is necessary either to drive (distances up to 10 miles) the cattle between pastures at seed ripe time and take a chance of separating the calves from their mothers or leave the cows and calves on poor feed.

The general feeling among ranchers interviewed was that calves born on the range make better replacement heifers than those placed on the range for the first time as adults. One rancher gave the following account of an incident concerning his ranching operation. After purchasing ten pregnancy tested replacement heifers, one died, and of the remaining nine, six calved prior to going on the range. When the cows were removed from the range in the fall, only four calves returned with the cows. In the spring of 1968 none of the nine had calved before they were turned onto the range.

Aside from the precious discussion concerning calves, the rest of the livestock picture on the Pleasant View is very favorable. The overall condition of the cattle on the range was good throughout both summers. Several ranchers feel the cattle are coming off the range in better shape than ever before. A few cows come off the range in the fall in poor

condition, but as a rule these are the older cows. Figures 20 and 21 show cattle condition at seed ripe time in 1968.

Forage Utilization

The factors affecting utilization are the location of water, access roads and trails, and slope. These are all interrelated and the degree to which anyone affects cattle distribution depends on the other two. When all three are favorable in an area, cattle use is very heavy (Figure 22).

Water is nearly the sole reason for distribution patterns of the cattle. Neither slope nor access affects the utilization of areas near water. Cattle will follow roads long distances and up steep slopes to graze. Those areas grazed the heaviest on ridge tops are always very near a road as shown in Figure 23. This often causes the ridge tops to appear heavily grazed and is very misleading when the range is examined from a vehicle. The degree to which slope hinders cattle activity is related to the location of water, accessibility of the area, and forage availability. With feed and water in the canyon bottoms, slope restricts cattle movement, but as feed and water in the bottom areas becomes less available, the slopes become less restrictive.

The physical features (water, access, and slope) of the Pleasant View Unit limits most of the cattle activity to the canyon bottoms or very near it. Of the 1157 cattle observed in 1967, 54 percent were in the canyon bottoms and 74 percent were either in the bottom or on the lower 1/3 of the hillside (Figures 24 and 25). Only 11 percent reached the upper third of the slope and the ridge tops. Herd size was smallest for those cattle grazing on the slopes than for those using the top (2.7 head) or the bottom (4.3 head).

Figure 20. Cattle condition in pasture V just prior to changing pastures, July 11, 1968.

Figure 21. Cattle condition in Wood Canyon just after changing pastures, July 17, 1968.

Figure 22. John Evans Canyon shows very heavy livestock use at a water trough with easy access and very little slope, August 28, 1968.

Figure 23. Ridge top that received heavy livestock use. Photo was taken from the road at the summit between Wood Canyon and Sheep Creek Canyon, July 11, 1968.

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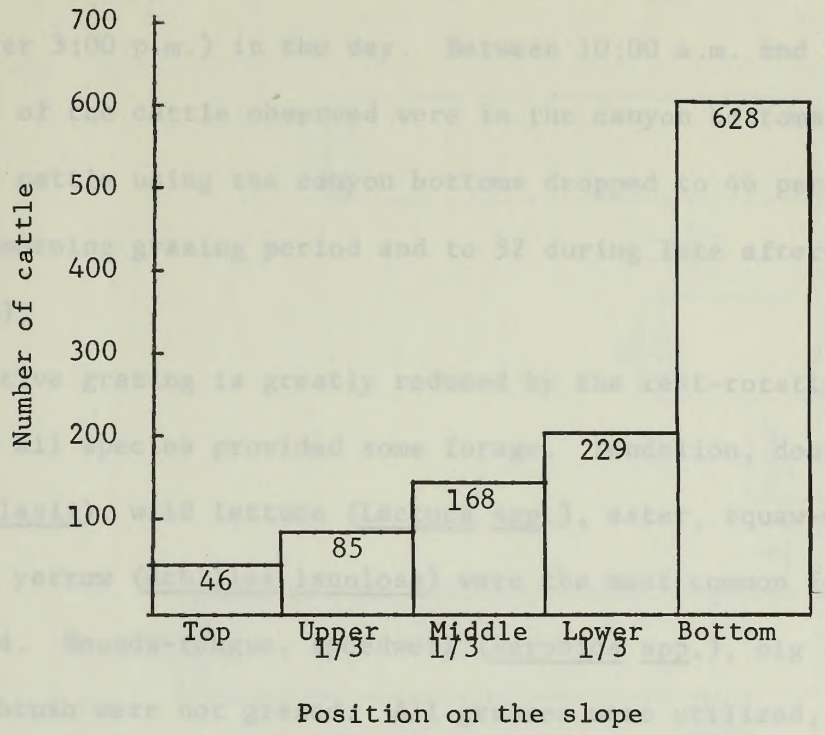


Figure 24. The total number of cattle observed occupying various positions on the slope in John Evans Canyon in 1967.

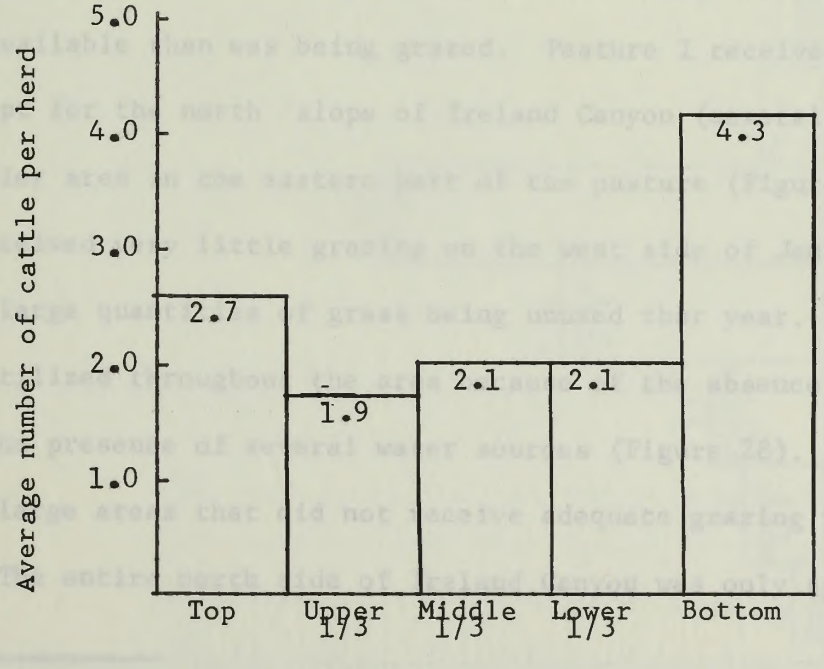
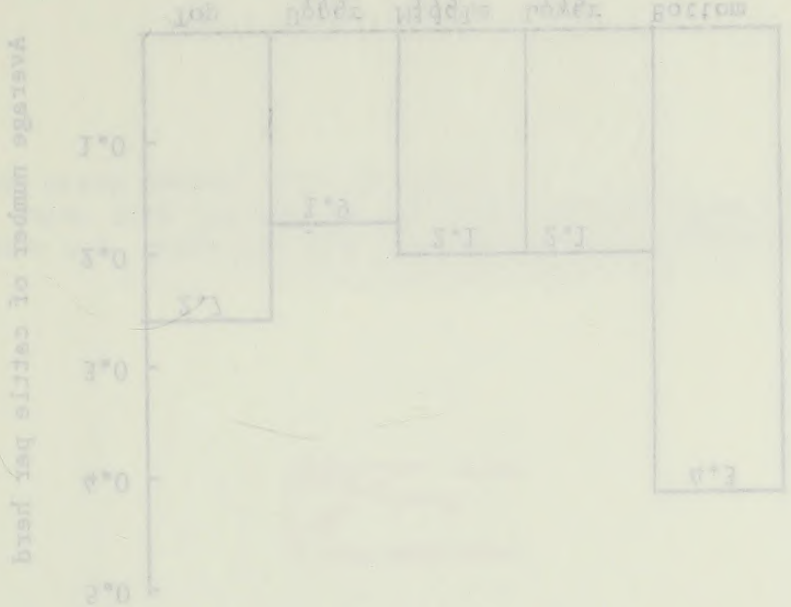


Figure 25. The average herd size of cattle observed at various positions on the slope in John Evans Canyon in 1967.


Position on the slope
top
upper
middle
lower
bottom
Average number of cattle per head per day
0.0
0.2
0.4
0.6
0.8
1.0

Cattle use the slopes either earlier (prior to 10:00 a.m.) or later (after 3:00 p.m.) in the day. Between 10:00 a.m. and 3:00 p.m. 67 percent of the cattle observed were in the canyon bottoms. The percentage of cattle using the canyon bottoms dropped to 46 percent during the early morning grazing period and to 52 during late afternoon grazing (Figure 26).

Selective grazing is greatly reduced by the rest-rotation system and nearly all species provided some forage. Dandelion, doorweed (Polygonum douglasii), wild lettuce (Lactuca spp.), aster, squaw-weed (Senecio spp.), and yarrow (Achillea lanulosa) were the most common forbs that were grazed. Hounds-tongue, speedwell (Veronica spp.), big sagebrush, and rabbitbrush were not grazed. All grasses were utilized, and serviceberry and bitterbrush were highly preferred browse species on the Pleasant View Unit.

A thorough examination of the Pleasant View range revealed much more feed was available than was being grazed. Pasture I received uniform use[17] except for the north slope of Ireland Canyon (several hundred acres) and a smaller area in the eastern part of the pasture (Figure 27). Pasture IV received very little grazing on the west side of Jensen Pass in 1967 with large quantities of grass being unused that year. Pasture V was well utilized throughout the area because of the absence of deep canyons and the presence of several water sources (Figure 28). Pasture VI had three large areas that did not receive adequate grazing pressure (Figure 29). The entire north side of Ireland Canyon was only sparsely used,

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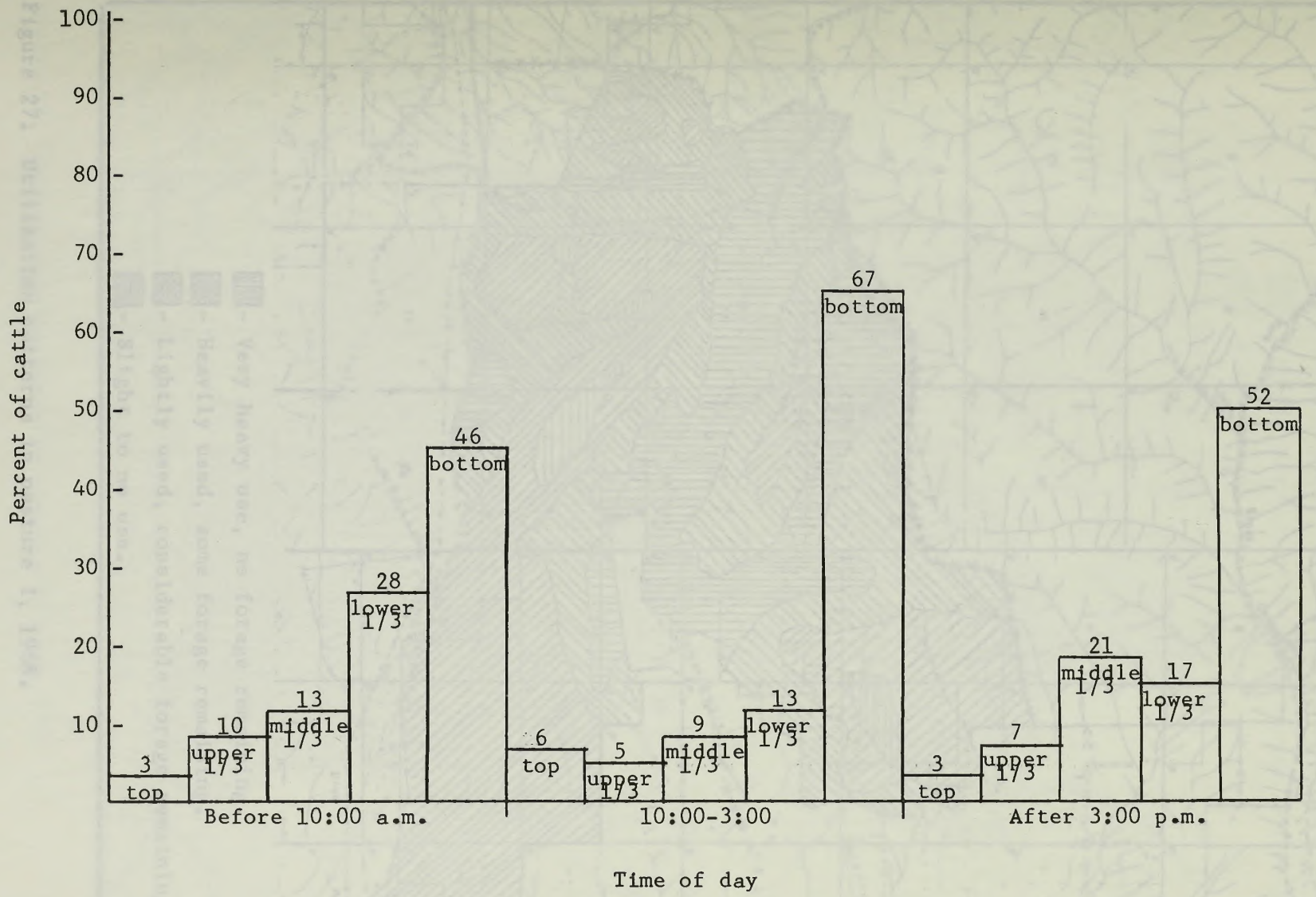


Figure 26. The percent of the total number of cattle observed occupying the various positions on the slope at three times during the day in John Evans Canyon in 1967.

Figure 2b. The percent of the total number of cattle observed occupying the various positions on the slope at three times during the day in John Evans Canyon in 1957.

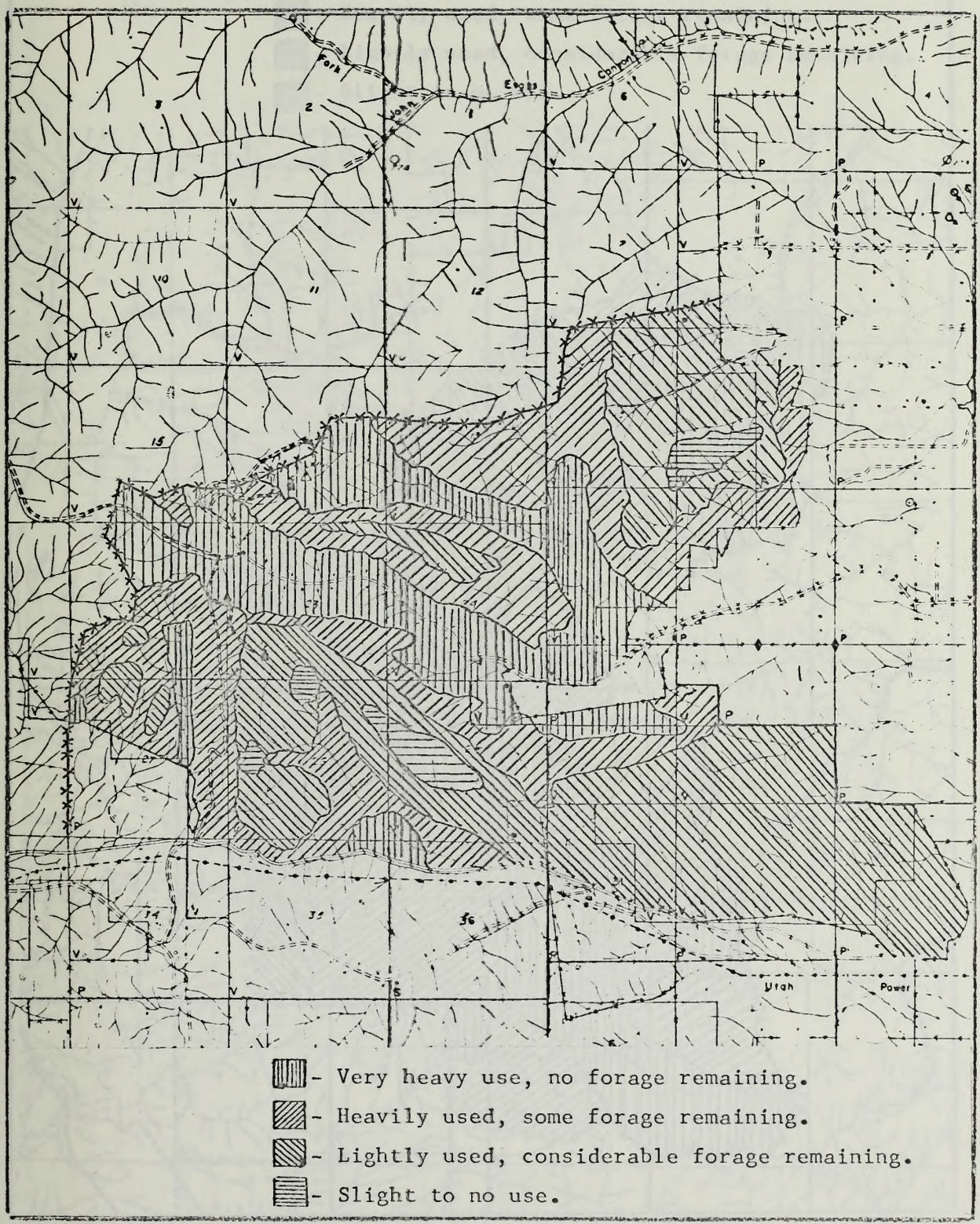
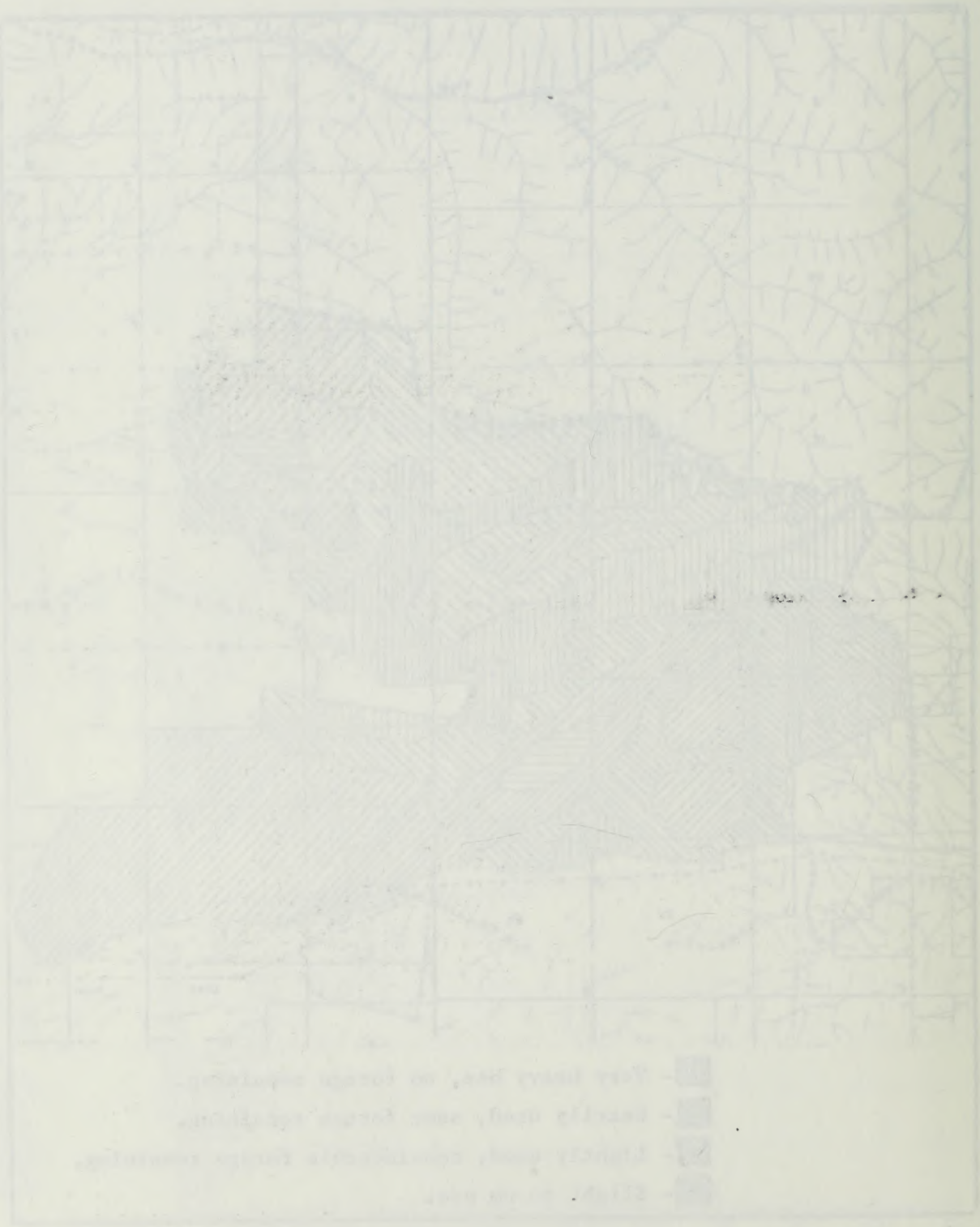


Figure 27. Utilization patterns in pasture I, 1968.



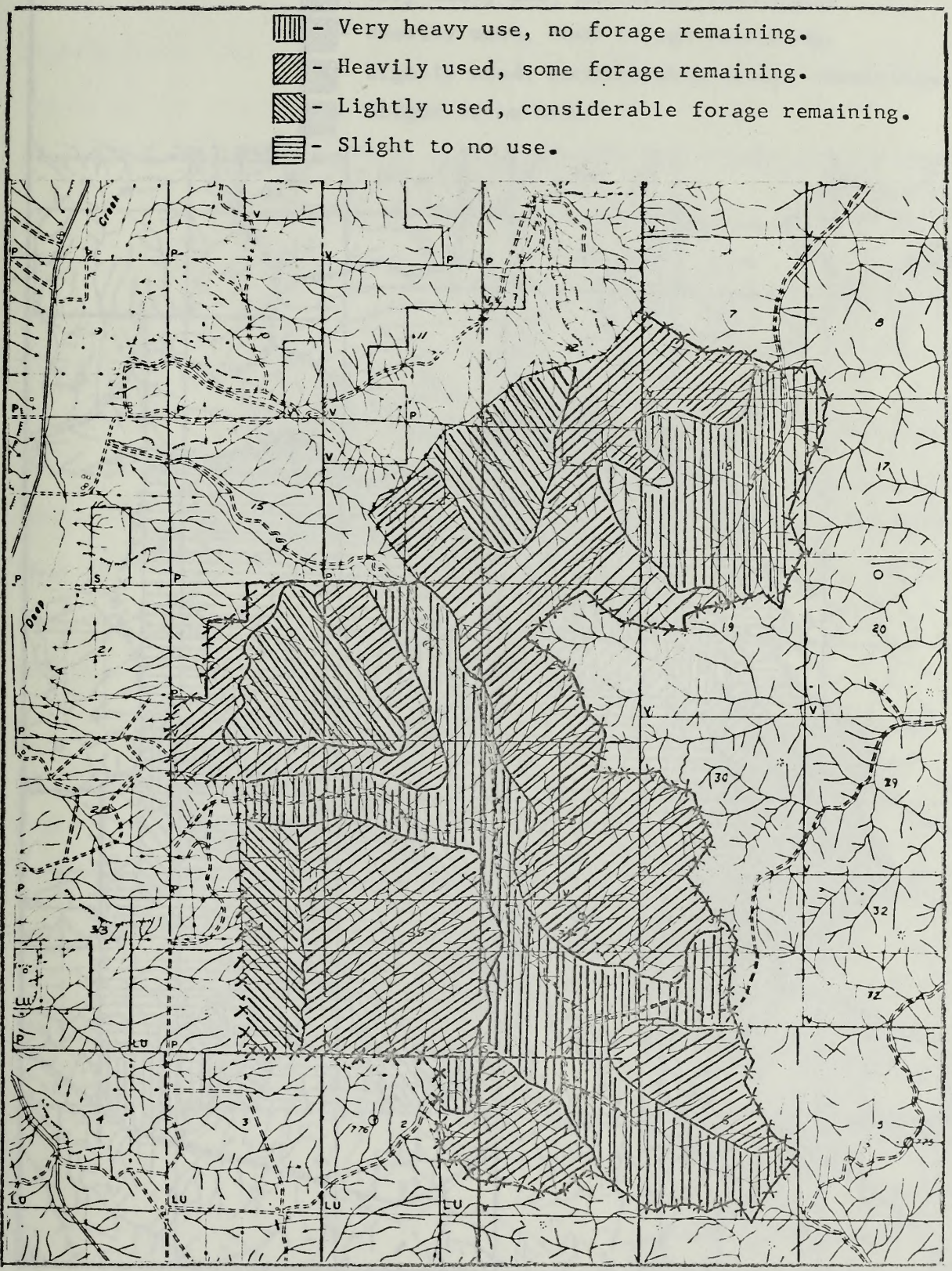
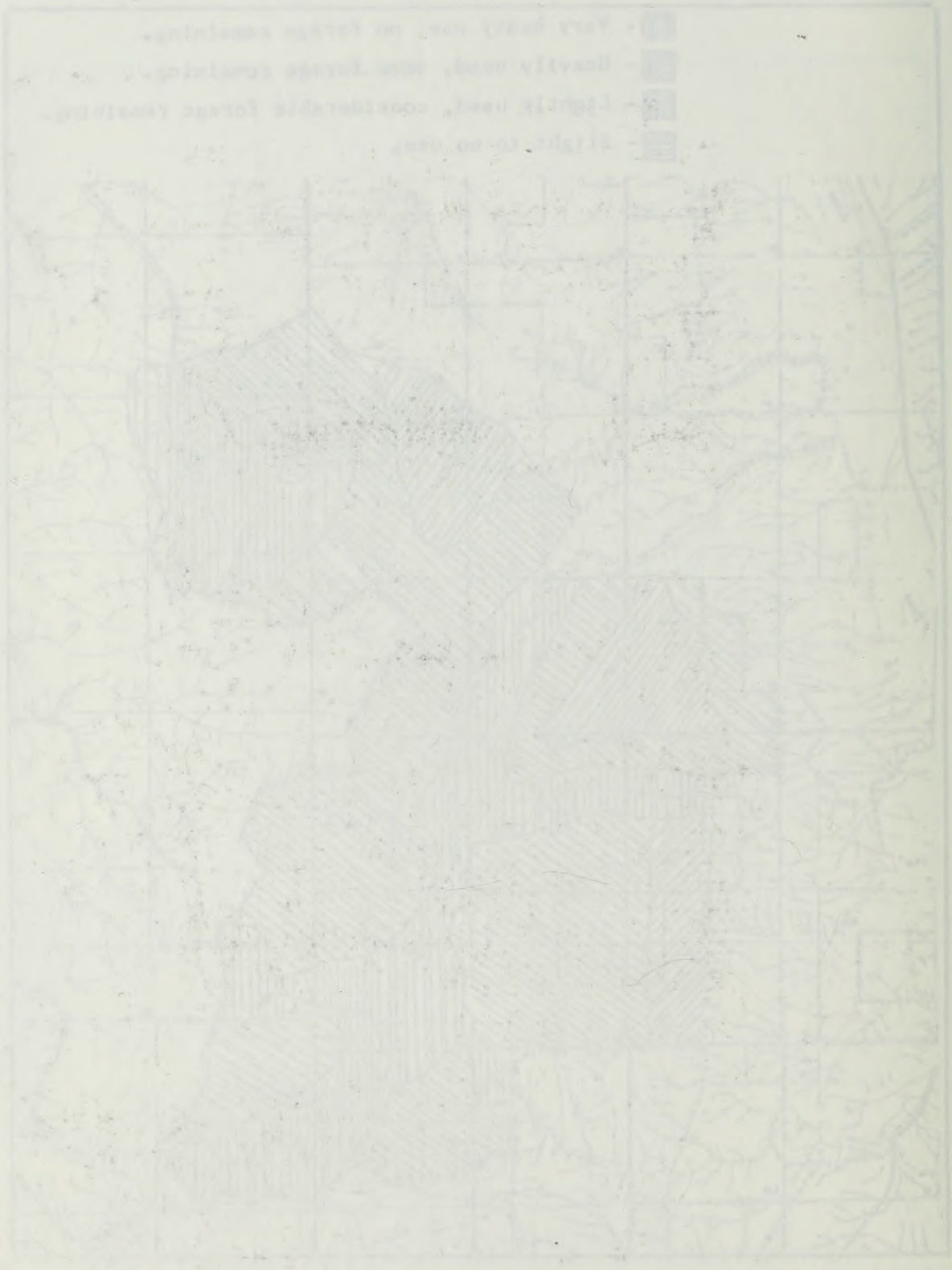


Figure 28. Utilization patterns in pasture V, 1968.



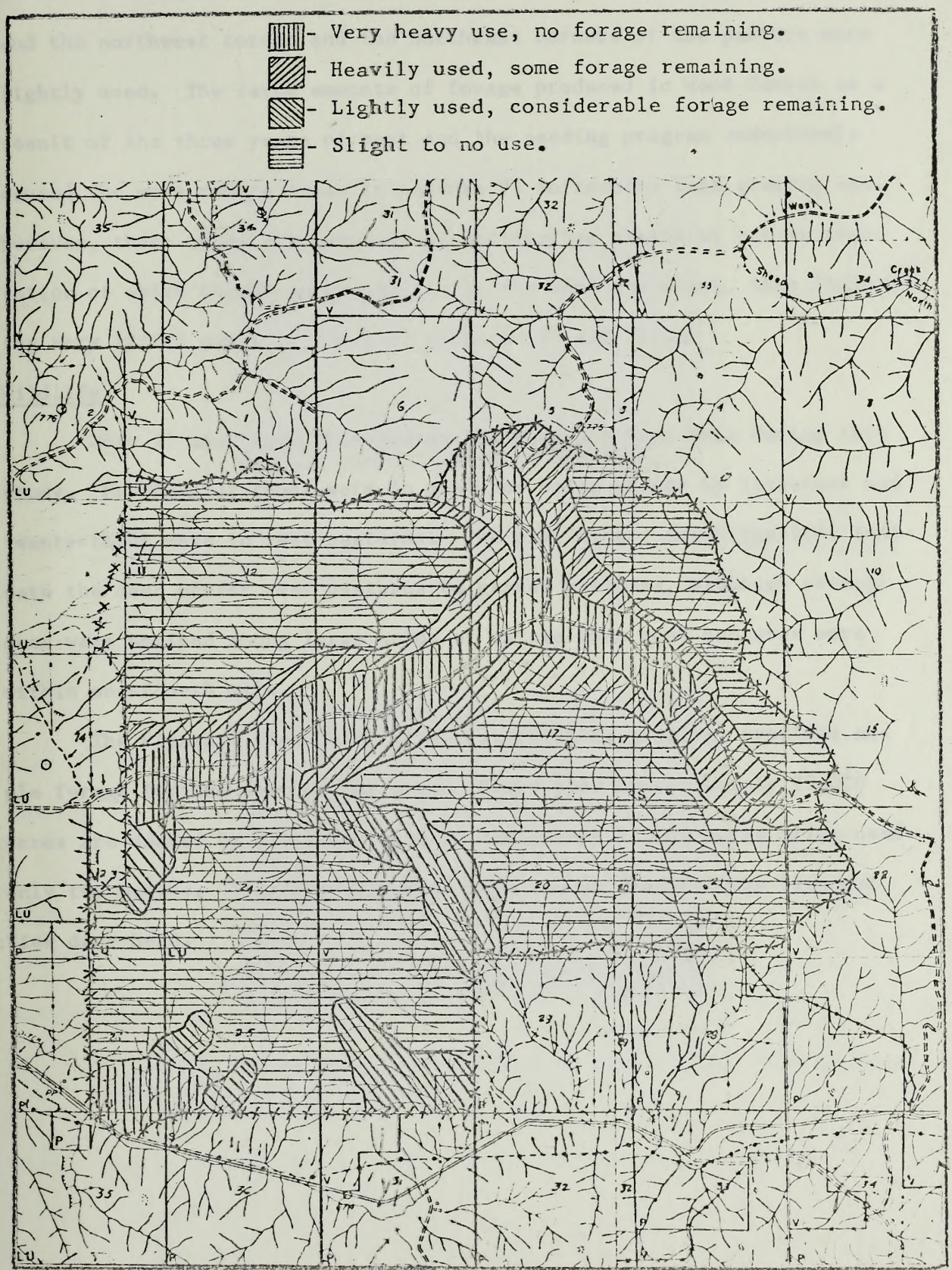
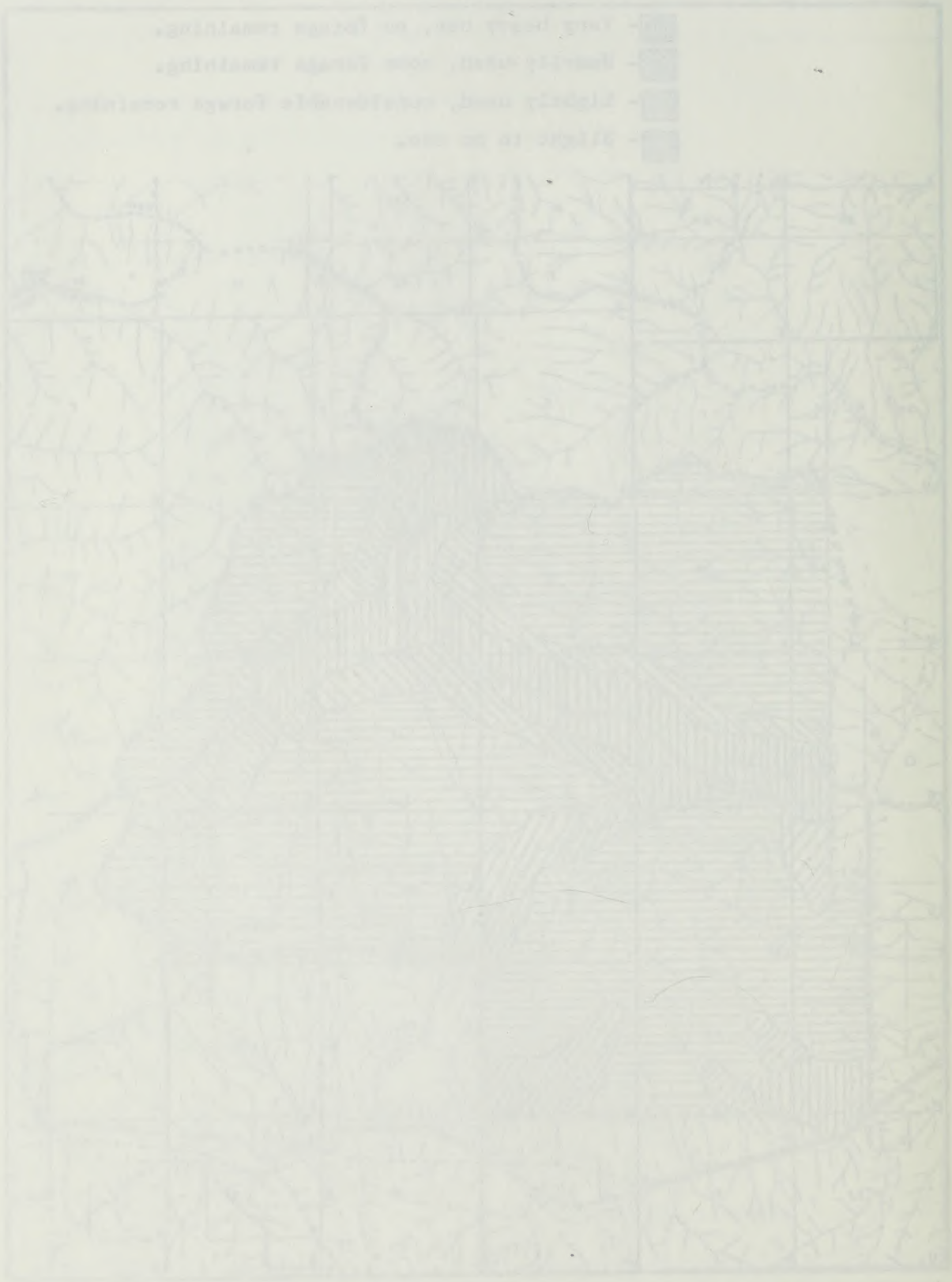


Figure 29. Utilization patterns in pasture VI, 1968.



and the northwest corner and the northeast corners of the pasture were lightly used. The large amounts of forage produced in Wood Canyon as a result of the three years of rest and the seeding program undoubtedly caused the more remote areas in pasture VI to receive less grazing use. However, these areas are composed of undisturbed stands of native vegetation of which bluebunch wheatgrass is the dominant plant, thus indicating very little abuse in the past (Figures 30 and 31).

Wildlife

Only 37 deer were observed on the Pleasant View Unit during this study. Fourteen of these were in pastures being grazed by livestock and twenty-three were in rest pastures. The preliminary investigations indicate the deer prefer rest pastures to grazed pastures, although several deer were noticed among large herds of cattle when rest pastures were within one-fourth mile.

The Pleasant View Unit, with rest-rotation grazing, provides ample forage for the deer on the area. Every year approximately 23,000 acres are unused by livestock with an additional 12,000 acres being used only two months. This provides more than enough feed for the Pleasant View deer herd.

Figure 30. An area near water that was not grazed during the entire grazing season. Bluebunch wheatgrass is the most frequent plant, Ireland Canyon (Pasture I), September 2, 1968.

Figure 31. Lower Wood Canyon (after 45 days of use) showing very little grazing use, September 2, 1968.

Figure 30. An area near water that was not grazed during the entire grazing season. Bluebunch wheatgrass is the most frequent plant, Ireland Canyon (Pasture 1), September 2, 1958.

Figure 31. Lower Wood Canyon (after 45 days of use) showing very little grazing use, September 2, 1958.

CONCLUSIONS AND RECOMMENDATIONS

From two years of study and observation it appears that rest-rotation grazing on the Pleasant View Unit is bringing the forage into line with the livestock demands. The new grazing system not only provides the plants with periodic protection from cattle grazing, but also provides for new installations (fences, water, etc.) and better control of the number of cattle turned on the range in the spring. Both the vegetation and livestock have responded favorably to these improvements.

Changes That Have Contributed the Most to Range Improvements

An important change involving the vegetation was the introduction of periodic rest periods for the plants. Only one-half of the range is used in any one year, and more important, only one-third is used during the critical spring period. The rest periods allow the plants to produce seed, permits seedlings to become established, and allows the plants to maintain a high level of vigor.

The change in grazing systems resulted in nearly a 25 percent reduction in cattle numbers. In 1968, 519 animal units were non-active,[18] plus some ranchers did not fill their active licenses. However, the greatest reduction in numbers resulted from a newly invoked procedure in which the BLM marked (with paint) each cow permitted on the range and thus reduced the number of illegal cattle using the range. Some ranchers estimate this process has reduced cattle numbers between 1000 and 1500 head.

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[18] U.S.D.I. 1968, op. cit.

Many new water developments and access roads were established with the changing of systems. This has led to better cattle distribution and thus increased the number of acres available for grazing (Figures 32 and 33).

Figure 32. Sheep Creek pump that provides water to John Evans Canyon, West Elkhorn Canyon and Morgan Jones Canyon, August 15, 1967.

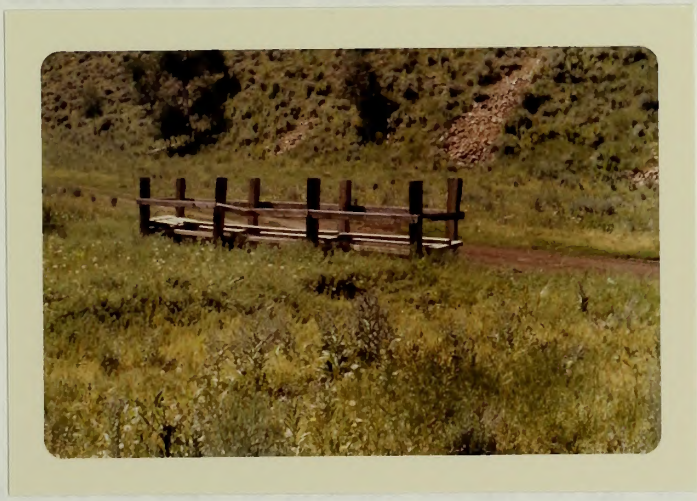

Figure 33. BLM water trough in West Elkhorn supplied by the Sheep Creek pump, July 11, 1968.

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Figure 32. Sheep Creek pump that provides water to John Evans Canyon, West Elkhorn Canyon and Morgan Jones Canyon, August 15, 1962.

Figure 33. BLM water trough in West Elkhorn supplied by the Sheep Creek pump, July 11, 1963.

Evidence of Improved Range Condition

Several of the 25 photoplots established by the BLM in 1965 showed improvement in 1968 (Figures 34 and 35). Not all the photoplots showed decided improvement but none showed any deterioration of the range.

Also contributing to improvement on the Pleasant View Unit were the seedings in Wood Canyon, North Canyon, and West Elkhorn. The increased forage production is shown in Figures 36 and 37.

Another indication of improvement on the Pleasant View Unit is the condition of the cattle. Many ranchers have stated that the cows are coming off the range in better condition than they were under continuous grazing (Figure 38). Also, the cattle are coming out of the mountains, voluntarily, later in the summer, thus indicating more feed is available on the unit. One Malad rancher stated that before changing grazing systems, the cattle would come off the range early in August and graze along the borrow pits in the Malad Valley. Only a few cattle congregated in the lanes in 1967 and 1968.

Correct Season of Use

When the principles of rest-rotation grazing are followed, the range is protected from cattle abuse, but cattle condition is not considered and is the result of decisions made by the range managers and the ranchers.

The range must be able to produce enough forage in the spring grazing period so the reproductive performance of the cattle is not restricted. When the cattle are turned onto the range too early, forage productivity for those pastures is greatly reduced. Because of early opening dates, near May 1, on the Pleasant View Unit the cattle have been

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Figure 34. BLM photoplot PV-II-21 in John Evans Canyon. The photograph above was taken by the BLM in August, 1965 and the photograph below is of the same plot and was taken on August 28, 1968.

Figure 34. BLM photoplot PV-11-21 in John Evans Canyon. The photograph above was taken by the BLM in August, 1965 and the photograph below is of the same plot and was taken on August 28, 1968.

Figure 35. BLM photoplot PV-III-17 in West Elkhorn Canyon. The photograph above was taken by the BLM in August, 1965 and the lower photograph is of the same plot and was taken on August 15, 1968.

Figure 35. BLM photoplot PV-III-17 in West Elkhorn Canyon. The photograph above was taken by the BLM in August, 1965 and the lower photograph is of the same plot and was taken on August 15, 1968.

Figure 36. The upper photograph is of lower Wood Canyon in the late 1930's. Both of the lower photographs are of the same area. The lower right photograph was taken on July 7, 1968 before grazing (approximately 100 yards down the canyon from the other two photographs), and the lower left photograph was taken on August 1, 1968 during grazing.

Figure 30. The rubber brontosaurus and the lowest Wood Carbon in the Late 1930's. Both of the
lower brontosaurus are taken on July 1,
1988 before starting (approximately 100 large dams the carbon from the other two bronto-
saurus). Both of the same area. The lowest right brontosaurus was taken on July 1,
Brachy), and the lowest left brontosaurus was taken on August 1, 1988 during August.

Figure 37. Wood Canyon in the late 1930's above (photograph taken by USFS) and the same location photographed on August 1, 1968 below.

Figure 37. Wood Canyon in the late 1930's above (photograph taken by USFS) and the same location photographed on August 1, 1958 below.

Figure 38. Cattle are coming off the range in good condition. Photograph taken in Wood Canyon, September 6, 1968.

losing considerable weight during the last portion of the spring grazing period. After the change of pastures, the cattle have ample feed and eventually leave in the fall with forage remaining on the range. For example, in 1967, the opening date was May 8, the cattle changed pastures on July 24, and they were taken home on September 8. Much more forage was produced in those pastures grazed after the seed ripe stage than those grazed in the spring, yet in this year the spring grazed pastures received 78 days of use and the summer pastures only 45 days of use. May 1 is usually late enough for sufficient growth at the lower elevations on the Pleasant View Unit but the higher elevations may still be snow covered (Figures 39 and 40).

Livestock production can be increased on the Pleasant View Unit by selecting an appropriate turn out date each spring that is dependent on the stage of development of the forage plants. May 15 would be closer to the correct opening date in more years than is the existing opening date

Figure 39. Lower Sheep Creek Canyon with 3 to 4 inches of new plant growth, April 24, 1968.

Figure 40. Upper North Canyon having many acres snow covered. This photo was taken just 6 days before the existing opening date of May 1. Photo taken April 24, 1968.

of May 1. There is no need to shorten the grazing season and it should be extended in the fall as many days as it is delayed in the spring.

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Selection of Seeding Species

The three species (intermediate wheatgrass, timothy, and orchard grass) used to reseed portions of the Pleasant View Unit all have very slow developmental rates. Neither timothy nor orchardgrass produced seed in 1967 or 1968. Intermediate wheatgrass was able to produce seed in 1967 but not in 1968 because the changing of pastures occurred before it had matured (matured on August 15, 1968). Since intermediate wheatgrass will have the opportunity to produce seed twice in each six year cycle and because it is slightly rhizomatous it should be able to maintain itself under rest-rotation grazing. However, the longevity of the orchardgrass and timothy is questionable since neither are rhizomatous nor have they produced seed.

Kentucky bluegrass is a grass that appears to be well adapted to the canyon bottoms of the Pleasant View Unit. Its hardiness and productivity are illustrated in Figure 41. This species responds quickly to

Figure 41. Kentucky bluegrass (in the background) responding quickly to one spring of rest. The area is in John Evans Canyon and within 1/4 mile of water. The area appeared to be void of perennial grass in 1967, July 9, 1968.

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brief rest periods and is capable of withstanding the very heavy and prolonged grazing that the canyon bottoms receive. The hardiness of Kentucky bluegrass is shown in photoplot III-1 in 1967 and 1968. This photoplot is located 13 feet from a water trough and, in the spring of 1967, one bluegrass plant was present. At the end of grazing that year, it appeared that no plants remained (Figure 42). However, in 1968 the response to the rest period was surprising (Figure 43).

The value of Kentucky bluegrass will be more apparent in the years to come. The present sequence of grazing and resting the pastures on the Pleasant View Unit is not going to be the best procedure for the distant future. As the range improves, the grazing system should change accordingly and consequently, by having a fast maturing and hardy species present in the canyon bottoms, much more flexibility can be worked into the system. Such as, species can be maintained with shorter and less frequent rest periods and therefore, increasing the AUMs available on the unit.

Improvements Needed

The scarcity of livestock water on the Pleasant View Unit is a serious problem. Overall, there appears to be more forage produced on the Pleasant View Unit than can be harvested by the permitted number of animals. However, the lack of water makes many large areas unavailable for livestock use.

The east side of Ireland Canyon is an area lacking water. Presently, water is hauled to a few areas along this canyon but more cattle and more water is needed to make adequate use of the area. The west side of Jensen Pass is also void of water and cattle are almost unable to

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Figure 42. Photoplot III-1 is an area near a water trough and appears void of perennial plants, September 9, 1967, after 1 1/2 months of grazing.

Figure 43. Kentucky bluegrass responding to one rest period after it appeared to be trampled to death (Figure 42), photoplot III-1, July 11, 1968.

use this side of the mountain.

The water situation could also be improved by improving the existing reservoirs. None of the reservoirs on the unit are protected from the wading cattle and consequently, large amounts of needed water is

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spoiled (Figure 44). These reservoirs should be fenced and the water piped into troughs below.

Figure 44. Water pond in Sublett Canyon that is not protected from cattle, June 29, 1967.

Sagebrush eradication and grass seedings are needed throughout the unit. Sublett Canyon and portions of Sheep Creek need the brush removed and grass planted. In other areas, where the slopes are too steep or rocky, it is suggested that by spraying the sagebrush, the grass understory would be released and would greatly increase the forage production. This procedure has been highly successful in other areas and is a rapid and non-expensive method of improving grass stands. Also, if seeding the aspen groves proves successful, then all such stands should be seeded.

Studies Needed

There is a need for further studies on the Pleasant View Unit. This study needs the following segments continued. All of the photoplots should be photographed each year at the seed ripe stage and all macroplots sampled at the seed ripe stage twice in each six year cycle, once just prior to the two year rest period and once during the second year of

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rest. The browse plants should be measured and photographed in the fall twice in each six year cycle, once in the year prior to the two year rest and once during the second year of rest. The BLM also has 25 photoplots that have to be photographed at the interval prescribed by their manual.

There is a need for an economic study. The possible questions that should be answered concern the expected returns from the money invested into water developments, range riders, and seedings. The need is great for further improvements on the unit but the economic returns from such developments should be anticipated before initiating the improvement.

A nutritional investigation should be made of the range. The calves coming late in the summer indicate that the cattle are turned onto a nutritionally deficient range. Having such knowledge would be of great value in determining the correct opening date in the spring. Also, if the range proved to be deficient, then animal production could possibly be increased by supplementing the range with needed minerals and nutrients.

Management Suggestions for the Pleasant View Unit

In order to get sustained maximum livestock production from the unit, both the land managers and the ranchers must operate as a team. The BLM should devise a management program that will protect and perpetuate those phases of multiple land use that are considered important on the area and then thoroughly explain it to the ranchers. By operating within the guidelines established by the BLM, the ranchers could operate freely and make the decisions concerning season of use and the numbers of AUM's to be harvested. Once the ranchers realize that the monetary returns they gain from the range depends upon their decisions, they will

seek to manage the resource within the limits to get maximum sustained returns.

The grazing system presently being used on the Pleasant View Unit is not a rigid system and deviations from it should not be ignored. Hormay (1967) stated that one out of every three years will produce inadequate quantities of forage and that those pastures being rested should be used at these times.[19] Deviations from the normal system provides flexibility and protects the ranchers from possible economic losses.

The range condition should change with time and the grazing system should be altered to fit the needs of the range as it changes. Range managers must be able to recognize these changes and adjust the grazing treatments accordingly.

The Pleasant View ranchers could greatly enhance the livestock production on the unit. There should be more bulls and/or better distribution of the bulls on the range. A range rider is suggested but the cost of hauling water is so great that the added expense has made this impractical in the past. However, there are 82 operators on the unit and a little effort on the part of each of these could help solve the cattle distribution problem.

While the ranchers are riding the range, especially in the fall, they should search for areas that were not grazed by the cattle during the summer. Such areas should be noted and more cattle turned out in these areas the following spring. Such an area was noticed in Ireland Canyon (pasture I) in 1968. It is suggested that more cattle be released

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[19] Hormay, 1967. op. cit.

seek to manage the resource within the limits to get maximum sustained returns.

The grazing system presently being used on the Pleasant View Unit is not a rigid system and deviations from it should not be ignored. Hormay (1967) stated that one out of every three years will produce inadequate quantities of forage and that those pastures being rested should be used at these times.[19] Deviations from the normal system provides flexibility and protects the ranchers from possible economic losses.

The range condition should change with time and the grazing system should be altered to fit the needs of the range as it changes. Range managers must be able to recognize these changes and adjust the grazing treatments accordingly.

The Pleasant View ranchers could greatly enhance the livestock production on the unit. There should be more bulls and/or better distribution of the bulls on the range. A range rider is suggested but the cost of hauling water is so great that the added expense has made this impractical in the past. However, there are 82 operators on the unit and a little effort on the part of each of these could help solve the cattle distribution problem.

While the ranchers are riding the range, especially in the fall, they should search for areas that were not grazed by the cattle during the summer. Such areas should be noted and more cattle turned out in these areas the following spring. Such an area was noticed in Ireland Canyon (pasture I) in 1968. It is suggested that more cattle be released

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[19] Hormay, 1967. op. cit.

in this area in the spring in the future. Also, pasture V was grazed more heavily than pasture I in 1968 and consequently the next time these two pastures are grazed concurrently, pasture I should receive more cattle than it did in 1968 and pasture V less.

Hounds-tongue is causing large numbers of calves to develop eye problems late in the summer. The seed from this plant possesses sticky burrs that get into the calves eyes. The effects of these infections could cause the loss of eyes and reduced weight gains.

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SUMMARY

In 1965 the Bureau of Land Management deviated from their customary policy of correcting improper grazing use by reducing livestock numbers and/or the season of use, on the Pleasant View Grazing Allotment near Malad, Idaho. Drastic alterations were needed on this unit to bring the cattle use into line with the forage supply. The BLM, with the aid of A. L. Hormay established a six pasture rest-rotation system on the unit. This system was designed to improve the range condition without reducing the existing season of use or cattle numbers. Since this was the first major rest-rotation system established in Idaho, the BLM felt that the range should be closely observed.

This study was then initiated and had the following objectives: (1) To describe the present range condition, (2) To provide data that will indicate either improvement or deterioration of the range because of the present system, and (3) To ascertain what improvements can be made in the present situation that will maintain and/or improve range condition without requiring a reduction in the number of livestock grazing the Pleasant View Unit.

The Pleasant View Unit, located in southern Idaho, is the northern extension of the Wasatch mountain range. The area is mountainous with moderate to steep slopes. The yearly precipitation average is 14.2 inches with most of the moisture coming in the winter and spring months. The existing vegetation is comprised primarily of big sagebrush and mountain shrub types. Quaking aspen, Douglas fir, and juniper also occur on the area.

The grazing history of the Pleasant View Unit reveals that large

SUMMARY

numbers of livestock have been responsible for reducing the once productive range to its present depleted condition. Livestock numbers, cattle and sheep, reached a peak during the late 1930's and early 1940's. Since that time, the numbers gradually decreased until 1965. At this time, the BLM felt further reductions would interfere with the welfare of the Malad economy and other solutions should be investigated.

Since very little information was available concerning the unit, it was felt that gaining some insight into all attributes of the area would be more beneficial for further work than concentrating all the effort into a few selected areas. Photoplots, frequency of occurrence of all species, production of all grass species, browse condition and phenological data were used to describe the vegetation on the unit. Soil erosion received a brief investigation with the placement of erosion stakes throughout the unit. Cattle activities and distribution patterns were studied as well as recording the locations of deer with respect to the cattle.

Nevada bluegrass, bluebunch wheatgrass and Kentucky bluegrass were found to develop at different rates within the unit depending on slope, elevation, and species. Variations in some cases approached 28 days.

Quaking aspen stands have suffered greatly from livestock use in the past and, presently, produce low quantities of forage. The sagebrush type is characterized by dense stands of big sagebrush. All areas that have been subjected to livestock use lack perennial grasses and have high frequencies of invading forbs and annual grasses. Attempts to artificially seed the canyon bottoms and aspen stands appear to be successful, but the longevity of these seedings is in doubt. Spraying dense stands of big sagebrush and releasing the perennial grass understory appears to be a

quick and cheap method of restoring range production.

Soil movement on the unit appears to be minimal. Excessive run-off water and soil movement comes primarily from the farmland adjacent to the unit.

There is reason to believe that the calf production on the unit is not optimum. The high number of cows calving late in the summer (a nutritionally deficient range in the spring, low bull numbers with very poor distribution and cows getting in rest pastures have probably accounted for this) and poor fence and gate placement indicate calf production could be increased.

Water, access, and slope largely determine the patterns of livestock use on the unit. There does not appear to be any conflicts in forage use between the livestock and the wildlife.

Rest-rotation grazing appears to be improving the condition of the Pleasant View Unit. Not only have the features of the grazing system such as the induced rest periods helped but the accompanying improvements required to establish the system have also been very important. Marking the cattle that are to use the range prior to turning out in the spring has resulted in a tremendous reduction in the AUMs taken from the unit each year. Water has been made available in several new locations and has increased the land area available for the cattle. Range seedings have also resulted in large increases in forage production.

Range improvement since the conversion to rest-rotation grazing is shown by several photoplots and by improved cattle condition on the unit. To make further improvements a flexible spring opening date and water developments and seedings are needed.

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Certain segments of this study plus a nutritional study and an economic study are needed in the future on the Pleasant View Unit.

To get maximum production from the area the ranchers must feel secure with their operations on the federal land. To obtain this the BLM should establish a grazing system that protects the resource, then allow the ranchers to operate freely within these established bounds.

When the grazing system was established by A. L. Hormay in 1965, it was not intended to be followed exactly. In low forage production years the rest pastures should be grazed and as the range improves through the years the system should change accordingly.

APPENDIX A

Plant List for the Pleasant View Unit

Grasses	Forbs
Agropyron cristatum*	Achillia lanulosa
Agropyron intermedium*	Agastache urticifolia
Agropyron Smithii	Agoseris sp.
Agropyron spicatum	Allium sp.
Agropyron spicatum var. inerme	Alyssum allysoides
Agropyron subsecundum	Antennaria rosea
Agropyron trachycaulum	Apocynum pumilum
Bromus inermis*	Arabis sp.
Bromus japonicus*	Arenaria aculeata
Bromus marginatus	Arnica cordifolia
Bromus tectorum*	Aster canescens
Calamagrostis rubescens	Aster sp.
Carex Geyeri	Astragalus Beckwithii
Catabrosa aquatica	Astragalus convallarius
Dactylis glomerata*	Astragalus utahensis
Deschampsia caespitosa	Balsamorhiza sagittata
Elymus cinereus	Calochortus sp.
Hesperochloa Kingii	Capsella Bursa-pastoris
Koeleria cristata	Castilleja angustifolia
Melica bulbosa	Chaenactis angustifolia
Oryzopsis hymenoides	Chenopodium sp.
Phleum pratense*	Cirsium vulgare
Poa ampla	Cirsium sp.
Poa annua*	Claytonia lanceolata
Poa bulbosa*	Collinsia parviflora
Poa Canbyi	Collomia sp.
Poa compressa*	Commandra pallida
Poa longiligula	Crepis occidentalis
Poa nervosa	Cryptantha nana
Poa nevadensis	Cymopterus longipes
Poa pratensis*	Cynoglossum officinale
Poa secunda	Delphinium bicolor
Sitanion hystrix	Descurainia spp.
Sporobolus airoides	Epilobium paniculatum
Stipa columbiana	Erigeron spp.
Stipa comata	Eriogonum microthecum
Stipa lettermanii	Eriogonum sp.

*Grasses known to be introduced onto the Pleasant View Unit.

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Stipa lettermanii	*Eriogonum* sp.

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APPENDIX A (continued)

Forbs (continued)

Eriophyllum lanatum
Erodium cicutarium
Erysimum capitatum
Fragaria glauca
Geranium viscosissimum
Gilia aggregata
Grindelia squarrosa
Habenaria elegans
Hackelia sp.
Haplopappus acaulis
Helianthus annuus
Heuchera falbellifolia
Hieracium sp.
Hydrophyllum sp.
Hyoscyamus niger
Iva axillaris
Kelloggia axillaris
Lactuca sp.
Lathyrus sp.
Lepidium perfoliatum
Linium Lewisii
Lithophragma parviflorum
Lithospermum ruderale
Lomatium triternatum
Lupinus caudatus
Lupinus laxiflorus
Malva neglecta
Medicago lupulina
Microseris nutans
Monolepis Nuttalliana
Oenothera sp.
Opuntia rhodantha
Osmorhiza chilensis
Penstemon acuminatus
Penstemon radicosus
Phlox longifolia
Plagiobothrys leptocladus
Polygonum douglasii
Potellia sp.
Pterospora andromedea
Rumex mexicanus
Senecio debilis
Senecio intergerrimus
Silene meneseii
Smilacina racemosa
Solidago sp.
Spergularia rubra
Sphaeralcea Munroana
Taraxacum officinale
Thalictrum sp.
Thlaspi arvense
Tragopogon dubius
Urtica sp.
Verbascum Thapsus
Veronica arvense
Viola adunca
Wyethia amplexicaulis
Zigadenus paniculatus

Shrubs and Trees

Acer glabrum
Amelanchier alnifolia
Artemisia dracunculus
Artemisia ludoviciana
Artemisia nova
Artemisia tridentata
Artemisia tripartita
Berberis repens
Ceanothus velutinus
Cercocarpus ledifolius
Chrysothamnus nauseosus
Chrysothamnus viscidiflorus
Juniperus osteosperma
Pachistima Myrsinites
Physocarpus malvaceus
Populus tremuloides
Prunus emarginata
Prunus virginiana
Pseudotsuga menziesii
Purshia tridentata
Rosa Woodsii
Salix sp.
Sambucus coerulea
Symphoricarpos oreophilus
Tetradymia canescens

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